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THE NATIONAL GEOGRAPHIC MAGAZINE

U. S. Capitol, Citadel of Democracy

BY LONNELLE AIKMAN

"YOUR CAPITOL," I once heard a Latin-American ambassador say, "really looks the part. With a position on a hill like that, it could be magnificent or ridiculous. It is magnificent!"

By night, batteries of searchlights trace this building's glowing dome on the blue-black vault of the sky. By day, sunshine and drifting clouds make picture-postcard scenes of the silhouette that symbolizes American democracy around the country and the world.

Through all the weather's moods, the United States Capitol dominates Washington's skyline. Only the slim shaft of the Washington Monument can challenge the lawmakers' 287-foot eminence atop old Jenkins Hill, which the city's first planner, Pierre Charles L'Enfant, called "a pedestal waiting for a monument."

To keep others from looking down on this citadel, building heights in the neighborhood are sharply restricted.

Seen from a distance, the Capitol has an air of solid majesty, a personality that seems placid and unchanging. Actually, within the thick walls for which President Washington laid the cornerstone in 1793, the story of this

 National Geographic Photographers B. Anthony Stewart and John E. Fletcher

Busy as a Beehive, the Capitol Swarms with Senators, Representatives, and Sight-seers

On "the Hill," hub of the Washington street system, stands the 287-foot Capitol, where the Nation's laws are made. Its original design was submitted in the 1792 competition by William Thornton, an amateur architect trained as a physician. Many changes have been made, including these 36 steps to the portico.

building is one of ceaseless variety, conflict, and motion.

Surrounding the formal halls where Senate and House of Representatives debate and decide the Nation's laws are hundreds of smaller rooms—committee and office rooms; administrative, clerical, and utility quarters; exhibit halls swarming with visitors.

A City in Four Walls

"This is almost a city in itself," said the veteran Architect of the Capitol, David Lynn, whose numerous duties include the maintenance, structural care, and improvement of the home of Congress.

Wandering miles along the corridors, I could see what he meant. I caught glimpses of restaurants and kitchens, stationery, barber, and carpenter shops, ticket offices, disbursing and banking offices, post offices, and even dispensaries and the attending physician's office.

As a footloose correspondent, I was permitted to explore libraries and document rooms that serve the Members of Congress. I checked in at police headquarters to talk with officers who guard the Capitol and its 131-acre grounds. I saw reception rooms and private dining rooms where the President is entertained on visits with congressional dignitaries.

Beyond the steep galleries that look down on the sessions of Senate and House, I walked through rooms full of desks, typewriters, and telephones where reporters for daily press, periodicals, radio, and television turn out each day's grist of news (pages 180, 182).

Yet, for all the stir and bustle, a spirit of history broods over the Capitol. It fills the air in legislative chambers that once echoed to the oratory of America's political giants, the bitter arguments of the "great debates."

National Geographic Photographer Willard R. Culver

Juliana: "Mankind . . . Has to Trust Largely to Your Good Judgment for Its Deliverance"

The Queen of the Netherlands, speaking on cooperation between the North Atlantic Treaty powers, addressed Congress in joint meeting in the House Chamber on April 3, 1952. President of the Senate Barkley and Speaker of the House Rayburn sit behind her. Prince Bernhard (front row, lower left) listens to his Queen.

No other building in the country can summon so many illustrious ghosts: Jefferson, Adams, and Lincoln; Webster, Clay, and Calhoun. There were the Chief Justices John Marshall, Charles Evans Hughes, and William Howard Taft, the only man in American history to serve both as President and as Chief Justice.

Art Teaches History

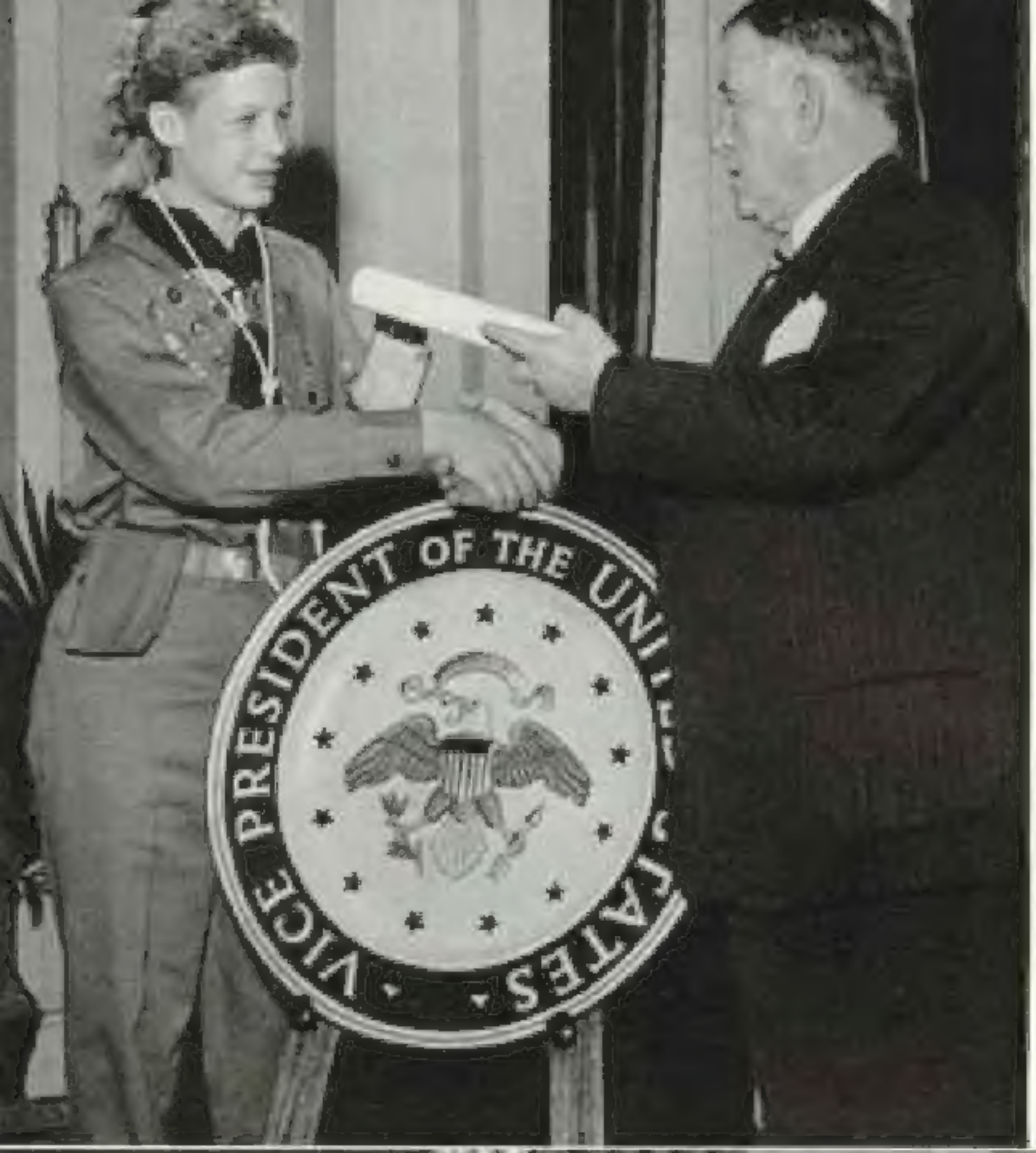
The past lingers in the antique mirrors and marble fireplaces of modern offices. Statues and portraits of statesmen and soldiers look down soberly on every chamber and corridor.

For the Capitol is more than a legislative factory. It is one of the Nation's foremost showplaces. Its art galleries and columned halls, its decorations and memorials are fascinating not only in themselves but in their graphic presentation of the American story.

Would you like to see what the first Speaker of the House, Frederick Augustus Conrad Muhlenberg, looked like? You will find his portrait hanging, with those of others who have held the post, in the long Speakers Lobby outside the Hall of Representatives.

The round, serene face of this Pennsylvania clergyman, who served in the Continental Congress and the first four Congresses of the United States, belies the fiery period of revolution and post-revolution in which he lived.

Or you may want to look up the bronze or marble likeness of the distinguished son chosen to represent your State in Statuary Hall (page 148). Of the 40 States which so far have contributed statues in response to the congressional invitation of 1864, only one has selected a favorite daughter. She was Frances E. Willard of Illinois, ardent feminist leader and temperance crusader.



Mr. Barkley Honors Daniel Boone VII

Vice President Alben Barkley, who used to represent Kentucky in the Senate, makes a Kentucky colonel of young Boone. The boy, a descendant of the famous frontiersman, wears a coonskin cap and the Boy Scouts' merit badge sash. The Vice President's seal, which stands on the easel in Mr. Barkley's office, was created by a Presidential order in 1948.

★ Girl Scouts Pass the Cookies

Sam Rayburn, Speaker of the House, and Joseph W. Martin, Jr., House minority leader, sample the offerings before contributing to the Girl Scouts' camping fund. Left to right, the girls are Anne and Lera Thomas, daughters of the Texas Representative; Linda Kefauver, daughter of the Tennessee Senator; and Marta Miller, from Texas.

National Geographic Photographers
B. Anthony Stewart and John E. Fletcher

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Ohio's Robert A. Taft Greets Visitors in the Senators' Reception Room

Constituents, lobbyists, and sometimes feathered Indians meet their Senators here. Constantino Brumidi, who decorated much of the Capitol in 25 industrious years, lacked time to fill the empty medallions (pages 164, 168).

National Geographic Photographers B. Anthony Stewart and John E. Fletcher

The Guide Whispers; Echo Carries Her Words Across Statuary Hall

Bronze and marble statues contributed by 40 States in honor of distinguished sons and one daughter give this room its name. Here the House met from 1807 to 1857, and here Representative John Quincy Adams, a former President, was mortally stricken with paralysis (pages 145, 152). Statues (l. to r.) show Delaware's Caesar Rodney, Ohio's William Allen, Arkansas's Uriah M. Rose, Mississippi's Jefferson Davis (bronze), Virginia's Robert E. Lee (bronze), and Rhode Island's Roger Williams. California's Junipero Serra (bronze) holds a cross, and Pennsylvania's Robert Fulton looks at a ship model.

Or perhaps you had forgotten the story of Edward Dickinson Baker, whose life-sized toga-draped figure stands in the high-domed Rotunda along with those of Washington, Jefferson, Lincoln, and others. Senator Baker of Oregon, Civil War hero and close friend of Lincoln, was killed as he led Union forces into action at Balls Bluff, Virginia.

According to contemporary news reporters, Lincoln wept when he learned of Baker's death. Congress later singled out the Oregonian for his place of honor in the Rotunda.

All three branches of the United States Government figure in the Capitol's history.

In one room or another of the old Senate wing the Supreme Court sat from 1801 until 1935. Most of our Presidents have taken the oath of office—some in rain or snow—outside the main east entrance.

Just before each Presidential inauguration, incoming Vice Presidents traditionally have been inducted into office in the Senate Chamber, where they also automatically assumed the role of President of the Senate. Since 1937, however (with the exception of the 1945 ceremonies at the White House), the Vice Presidential swearing-in has been part of the inaugural procedures on the Capitol's east-front platform.

How the Capitol Has Grown

Physically, the Capitol has grown up by bits and pieces, its construction alternately promoted and delayed by national pride and practical difficulties. The process began years before the Federal Government was moved, in 1800, to the wilderness capital by the Potomac.

National Geographic Photographer Willard R. Culver

An Artist Sitting on the Platform-supported Canvas Cleans a Rotunda Painting

Marie Kalnoky freshens "The Surrender of General Burgoyne," one of four documentary pictures made by John Trumbull especially for the Capitol (pages 154, 156, 157, and 177). Trumbull (1756-1843), who drew on his own Revolutionary experiences, had the additional advantage of painting his heroes in the flesh.

Curiously, the original design for this building—the only one submitted that met George Washington's specifications for "grandeur, simplicity, and convenience"—was the work of an amateur architect. Dr. William Thornton, who won $500 and a city lot for his entry in the Capitol competition of 1792, was a physician by training.

Brilliant and versatile, Dr. Thornton turned out his classically based design with as much ease, apparently, as he dashed off poetry, painted portraits, and experimented with steamboats and speech for the deaf.

Talented professionals—notably Benjamin H. Latrobe, Charles Bulfinch, and Thomas U. Walter—made their contributions as Capitol Architects. Despite disputes and setbacks, they tailored and merged the various elements and additions into the present structure.

But the record also gives credit for the overall success of the work to the guiding role of other amateurs in architecture—the successive Presidents of the United States.

Both Washington and Jefferson had a direct hand not only in making broad decisions affecting the building's design, but in such practical measures as importing hard-to-find skilled masons, carpenters, and sculptors.

So closely was Jefferson associated with plans for the Capitol that he has been erroneously credited with certain of its more original designs. It seemed logical, for example, to attribute Latrobe's charming and unusual cornstalk and tobacco decorations at the head of some of the interior columns to Monticello's master of the ingenious gadget (page 170).*

Oldest section of the Capitol is the rectangular north wing, now the connecting link between the central Rotunda and the big Senate extension (chart, pages 174-175).

* See "Mr. Jefferson's Charlottesville," by Anne Revis, NATIONAL GEOGRAPHIC MAGAZINE, May, 1950.

It was there, in a building of propped-up arches and temporary partitions, that Congress held its first joint session on November 22, 1800. It was addressed by President John Adams, who, with his wife Abigail, was having his own housekeeping troubles in the new White House at the other end of the forest- and meadow-framed trail ambitiously called Pennsylvania Avenue.

Congressmen Baked in an "Oven"

Some seven years more were to pass before the Capitol's twin south wing, including what is now Statuary Hall, was ready for the House of Representatives. Meanwhile, the Representatives met in the Senators' north building, with a three-year interlude in a queer oval-shaped structure temporarily erected on the south site and descriptively known as the "Oven."

Even before the move into the Oven, the original House Chamber in the north wing was the scene, in February, 1801, of the exciting climax to Washington's first major political struggle. The issue was the contested Presidential election between the two leading candidates, Jefferson and Aaron Burr, the latter already a sinister figure. Since the electoral vote was tied, it was up to the House, under the constitutional rules of the day, to make the decision that would give one man the Presidency, the other the Vice Presidency.

The eyes of a tense nation turned to the House as a six-day deadlock followed. During the final 30-hour struggle before Jefferson was announced the winner, one determined Member voted from a sickbed set up at the scene of action!

In these early building phases the two Capitol units were united only by a wooden walkway. At one time, public springs bubbled in the intervening open space; around them children played and neighboring housewives gathered to gossip and fill their buckets.

It was not until the reconstruction after the burning of the building in the War of 1812 that a connecting rotunda came into being. Completed in the mid-1820's, its low, copper-covered wooden dome was modest compared with the towering iron dome that eventually was to take its place.

But the country was growing fast—almost doubling its population every two decades—and the Federal Capitol on Jenkins Hill both reflected and influenced the changes and developments.

A dozen States joined the Union between 1820 and the outbreak of the Civil War. With each newcomer, more and more Members were added to Congress. Debates also grew hotter and more complex—the Missouri Compromise of 1820; Andrew Jackson's bank battles of the 1830's; the slave and free-State controversies of the 1850's.

Today, in the quiet, seldom used Old Senate Chamber, you find a small picture showing this room just as it was in 1850. Below it hangs a chart of each Senator's place.

"There's where Webster, Clay, and Calhoun sat," said my companion, Col. Carl Miller, of the Capitol's professional Guide Service. "Sam Houston, who'd been President of the Republic of Texas twice, was here then. So was Stephen Douglas, even before his debates with Lincoln. And Seward and Chase, who later served in Lincoln's Cabinet. And his Vice President, Hannibal Hamlin."

I followed his finger down the list. "And look! Jefferson Davis, too. With so much in the history books about Davis as President of the Confederacy, you forget he had an important Senate career before."

Barracks, Bakery, and Hospital

Through the years, neither crisis nor war halted the Capitol's growth. In 1850, despite the approaching civil conflict, Congress voted funds for two big extensions.

The first session of the House (237 Members) was held in the new south-wing addition in December, 1857. Nearly a year and a month later, the Senate moved over to the comparable north building, while the Supreme Court transferred its quarters from the ground floor into the vacated Senate Chamber.

During the fateful days of the Civil War, when Washington was a borderline town and sometimes a beleaguered one, the Capitol served as barracks, military bakery, and hospital.

Some of the Union's first volunteer troops were quartered in the Senate and House Chambers; there they amused themselves by holding mock legislative sessions. Others slept on the floor of the Rotunda, their new rifles stacked high under John Trumbull's historic paintings of the Revolution.

At one time long lines of dusty wagons rolled up to the basement entrances bearing valuable loads of flour evacuated from threatened Georgetown bakeries. Later, as the wounded poured back from the battlefields into the crowded, harried city, volunteer nurses and doctors found their patients in rows of hospital beds set up between the statues and busts.

Above all the activities, the clanking and pounding of workmen putting up the vast new cast-iron dome went on. For President Lincoln, who had known this building well as an Illinois Congressman from 1847 to '49, was determined to keep the construction going as a symbol of the strength and the future of the Union (page 168).

Kodachrome by William R. Culver

Beacon of Liberty and Treasury of Art: the United States Capitol

De Soto's Mississippi Discovery and Pocahontas's Baptism Impress Visitors to the Rotunda

Americans and French Accept the British Surrender at Yorktown, 1781. George Washington Sits on His Charger (Right)

[illegible]

A Committee of Five Presents the Declaration of Independence to John Hancock in Philadelphia. Painted by [illegible]

[illegible] Adams, Roger Sherman, Robert [illegible] [illegible] Jefferson [illegible] Franklin [illegible] the Second Continental Congress adopted [illegible] [illegible] Jefferson [illegible] [illegible] John Hancock [illegible] a [illegible]

General Gates, in Embroidered American, Accepts General Burgoyne's Sword after the Battle of Saratoga. By Trumbull

Perry on Lake Erie: "We Have Met the Enemy, and They Are Ours"

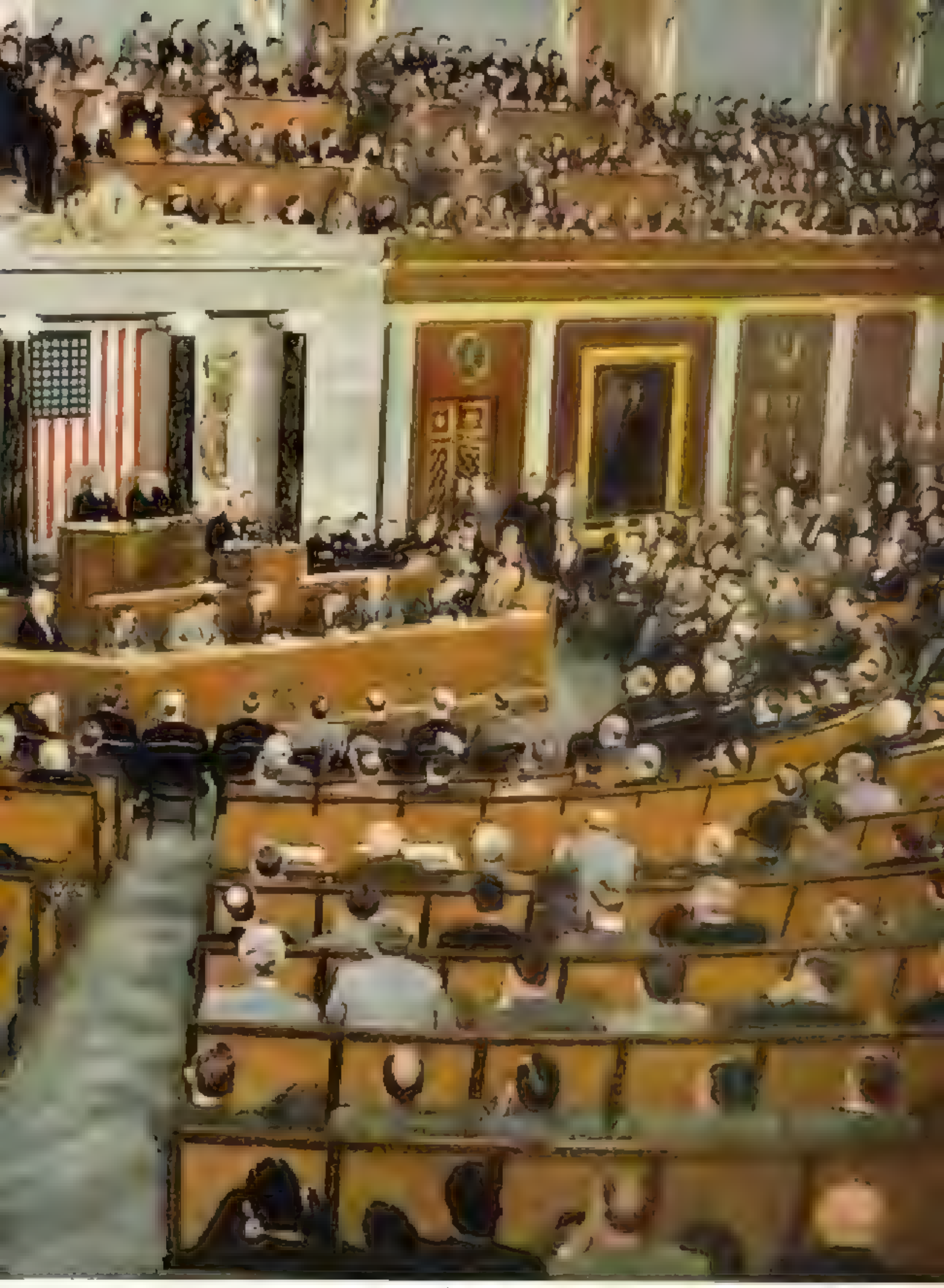
[illegible]

Constantino Brumidi, "Michelangelo at the Capitol," Adorned Its Walls with Vivid Murals and Ageless Frescoes, Valley Forge

Brumidi's "Battle of Lexington" Gives Honor and Glory to the Senate Appropriations Committee Room

Lawmakers, Press, and Visitors Crowd the House Chamber for a Joint Meeting

[illegible] Photograph courtesy Washington and Lee University.



Britain's Winston Churchill Addresses the U. S. Congress for the Third Time

On January 6, [illegible] President [illegible]

Cherubs Whirl above the Crystal Chandelier in the Senate Reception Room

[illegible]

Bacchanal Peace and Scowling War Deck a Sunny Room

[illegible]

[illegible]

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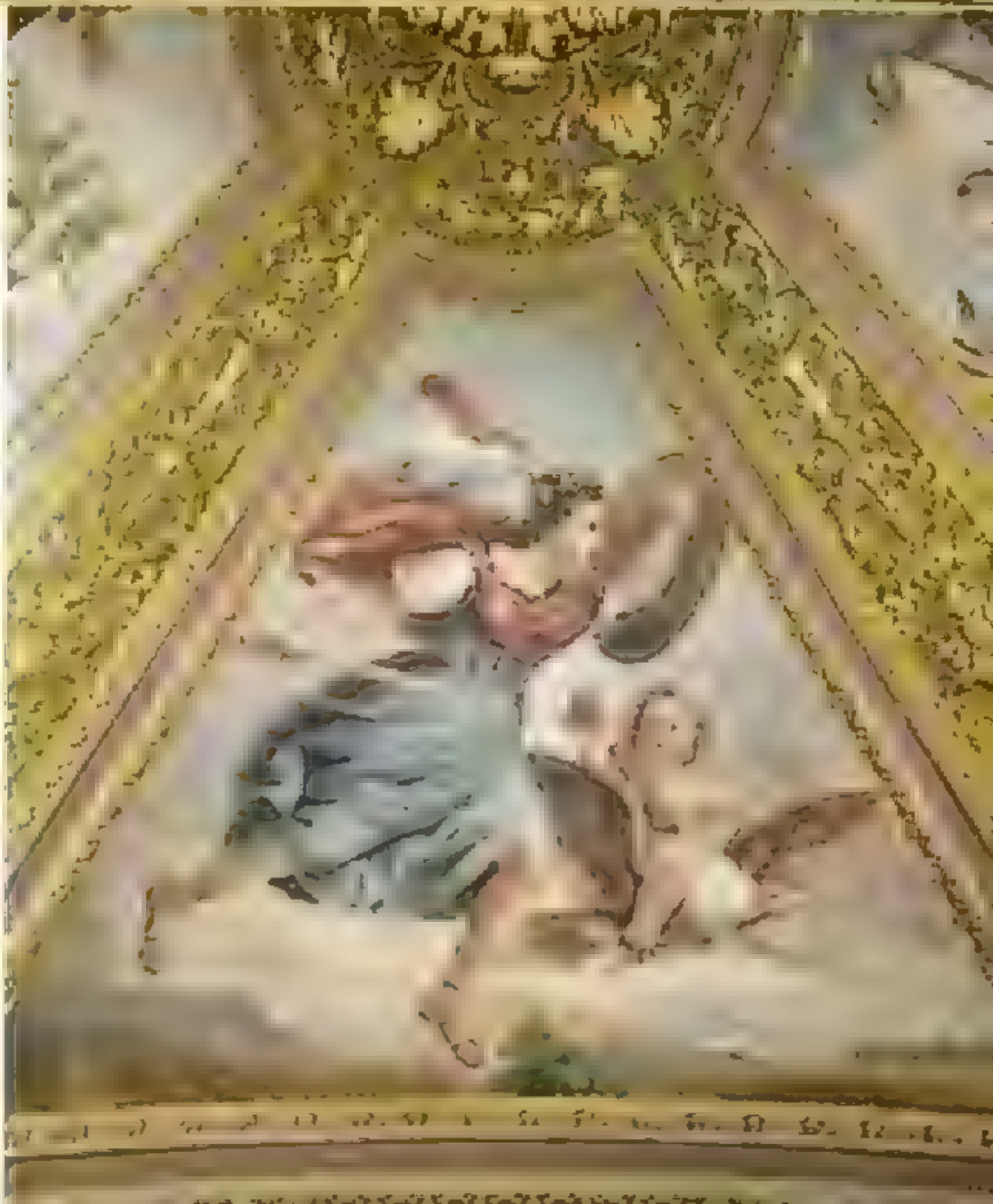


Geographia and Hesiodus Illustrantur, the Seasons Discover at Columbia Rotunda

At last came the hoisting of the Capitol's towering feature, the giant goddess, Statue of Freedom, designed by the prolific and imaginative Thomas Crawford.

[illegible] nearly 20-foot figure, with flowing drapery, eagle-feathered helmet, and wreathed [illegible] a saga in itself. Completed in Crawford's Rome studios in 1857, the unwieldy plaster model was eight months in reaching the United States, after a passage beset by storms, leaks, and other all-but-fatal sailing problems.

Wartime conditions further delayed the casting in bronze, and it was not until late in 1862 that the statue was set up temporarily on the Capitol Grounds for the public to view.

Guns Greet a Goddess

The triumphant raising of "Armed Liberty" to her lofty spot above the dome was accompanied by a significant bit of power display. As the head piece slid into place at high noon, December 2, 1863, the American flag was unfurled, a 35-gun salute boomed out from the Grounds, and in turn an iron-throated answer was roared by cannon from 12 of the forts then encircling Washington.

The Capitol, as we now see it, was finished then. But huge office space annexes were still to come, as congressional needs expanded. The House Office Buildings were completed in 1909 and 1933. The Senate Office Building was occupied in 1909, and four years later was linked to the Capitol by means of that treasured convenience, the Senate subway, popularly known as the "Immerville Trolley" (page 169).

Even yet, some say, the Capitol itself is incomplete. In the room below the Rotunda [illegible] model built in 1903-04 to illustrate proposals for an extension of the building's central east front (page 172).

The project was never carried out, though periodically the subject breaks into the headlines. Those who oppose the change say the Capitol should be left the way it is, as a historical monument. Others, including President Truman, argue strongly for the extension.

Architects wholeheartedly agree that the addition would correct the false impression of lack of dome support, add space to the building, and, moreover, provide an opportunity to replace the old sandstone center with marble to match the wings.

You can imagine what a tremendous job is involved in the basic care and upkeep of the Capitol when you consider such staggering statistics as these: 14 acres of floor space, 11 elevators, 435 rooms, and 679 windows.

Whenever the way has been cleared by congressional recess, battalions of extra cleaners, painters, carpenters, repairmen, and other skilled and unskilled workers join the "regulars." They swarm over the building on assignments that may range from painting the big dome (1,000 gallons every four years), to polishing each tiny pendant of mammoth crystal chandeliers (page 179).

In addition, the Capitol's art treasures call for special attention.

The Lady Who Irons Paintings

I came on a curious sight in the Rotunda one day. Trumbull's huge painting, "The Surrender of General Burgoyne," was out of place, its empty frame resting on the floor and attached to ropes suspended from a balcony high in the dome. The picture lay face down on a platform built to size, while a small blue-smocked woman went over its surface with an electric iron (page 149).

The ironer, I learned, was an artist from Vienna, working for a Washington art store which is under contract to freshen and repair three of the Rotunda's eight historic paintings. The warm iron was taking up excess wax so that a new protective backing could be applied to the canvas.

A small patch caught my eye. "Is that the spot," I asked, "where some vandal cut a hole in Daniel Morgan's boot?"

"No," came the answer. "That's where a workman's ladder slipped. But someone *did* slash a big piece out of the 'Battle of Lake Erie,' on the Senate east stairway. Look closely and you can see where it was mended" (page 158).

Now and then the problems of Capitol upkeep go far below the surface to basic and structural needs.

"Last year we finished the biggest job undertaken since they built the dome," Architect Lynn told me when I visited him in his gilt-vaulted groined-arch room. "That was the reconstruction of Senate and House Chambers and roofs."

Both legislative halls now have new, solid roofs in place of the dangerous and defective old ones with their ringy glass and iron skylights. Ceilings of stainless steel and plaster, with soft, indirect lighting, have replaced the unsightly crisscross supports put up in 1940 to protect the lawmakers from then perilously sagging surfaces.

The two Chambers have been redecorated in different colors—Senate red and gold, House blue—and given improved acoustics and air conditioning. Additional provision has been made for radio and television pickup. In the House, rows upon rows of comfortable leather chairs have been substituted for the old "fixture seats" (pages 162-163).

Only a few relics remain, in fact, to link

The Great Dome Was But Air When the Crowd Gathered for Lincoln's Last Inaugural

[illegible] with the tra[illegible] other years. Among them [illegible] the old [illegible] and [illegible] and [illegible] and [illegible] [illegible]

[illegible] revival of interest [illegible] artist who fled to [illegible] political persecution (pages [illegible] and [illegible] 1950)

[illegible] will mark the [illegible] sailing into New York Harbor [illegible] and day were the [illegible] the Capitol [illegible]

[illegible] began [illegible] his [illegible] a few years after his arrival, that he added to his signature the title, "Citizen of the U. S.

He Painted for Freedom

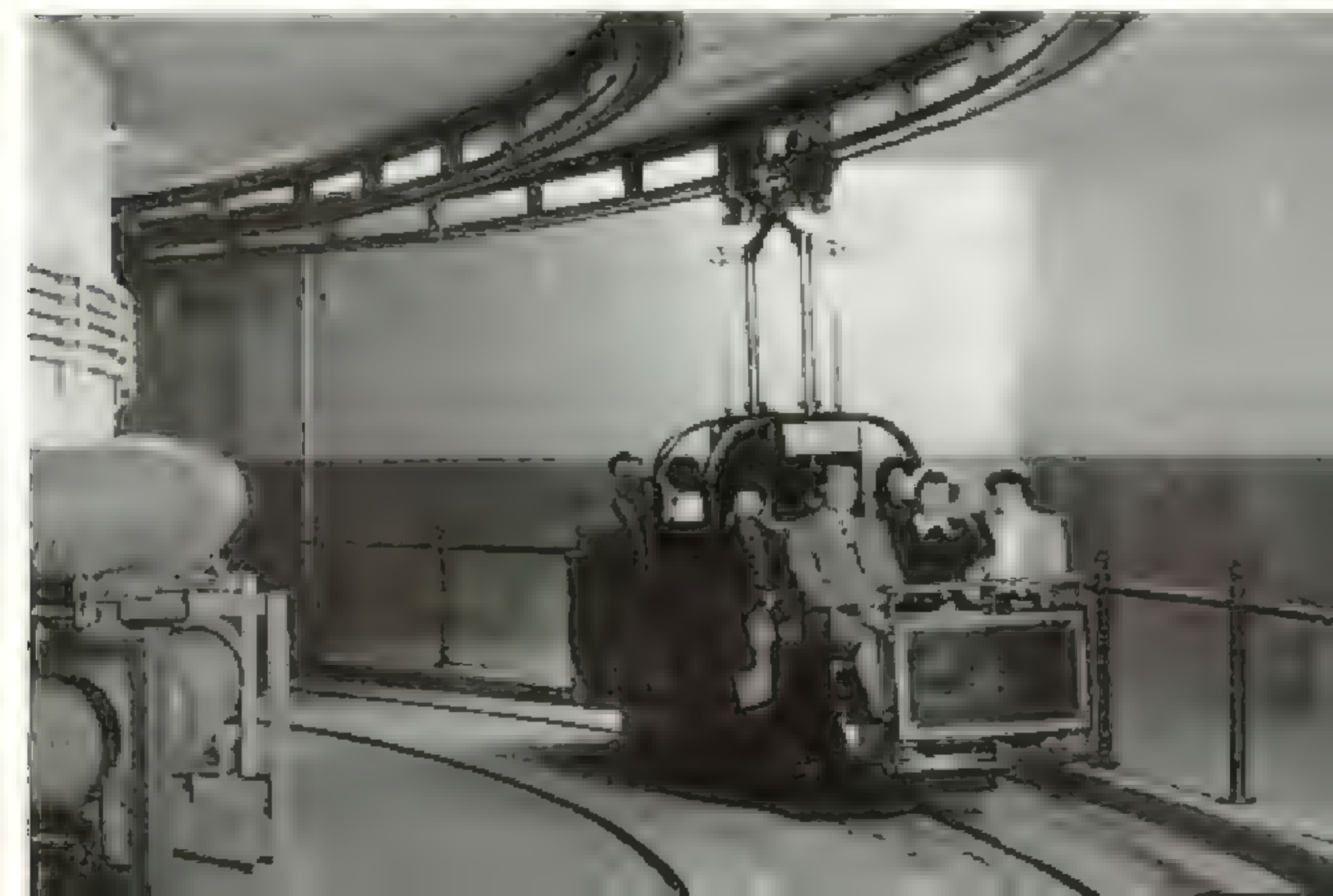
Himself had acquired U. S. citizenship as soon as possible. Character [illegible] has [illegible] these words:

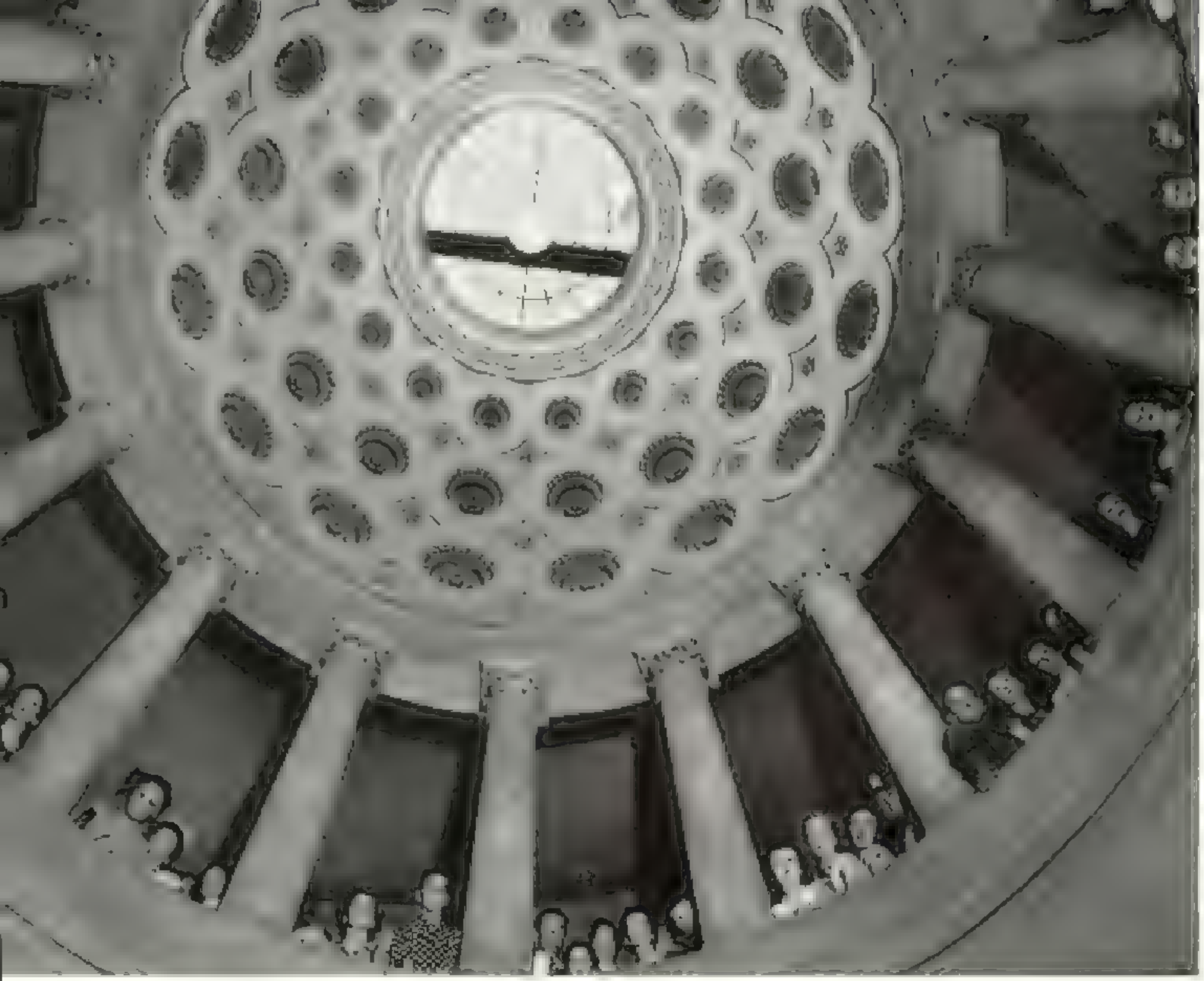
"By one application and one [illegible] [illegible] Capital of [illegible] country [illegible] which they [illegible]

[illegible] for [illegible] The Brumidi [illegible] and [illegible] gallows and [illegible] stand out in splash [illegible] color on [illegible] ceilings and wal[illegible]

Senators Weary of Tunnel Escape to Their Private Lobby

Angrette May Go for a Ride on the Senate Subway

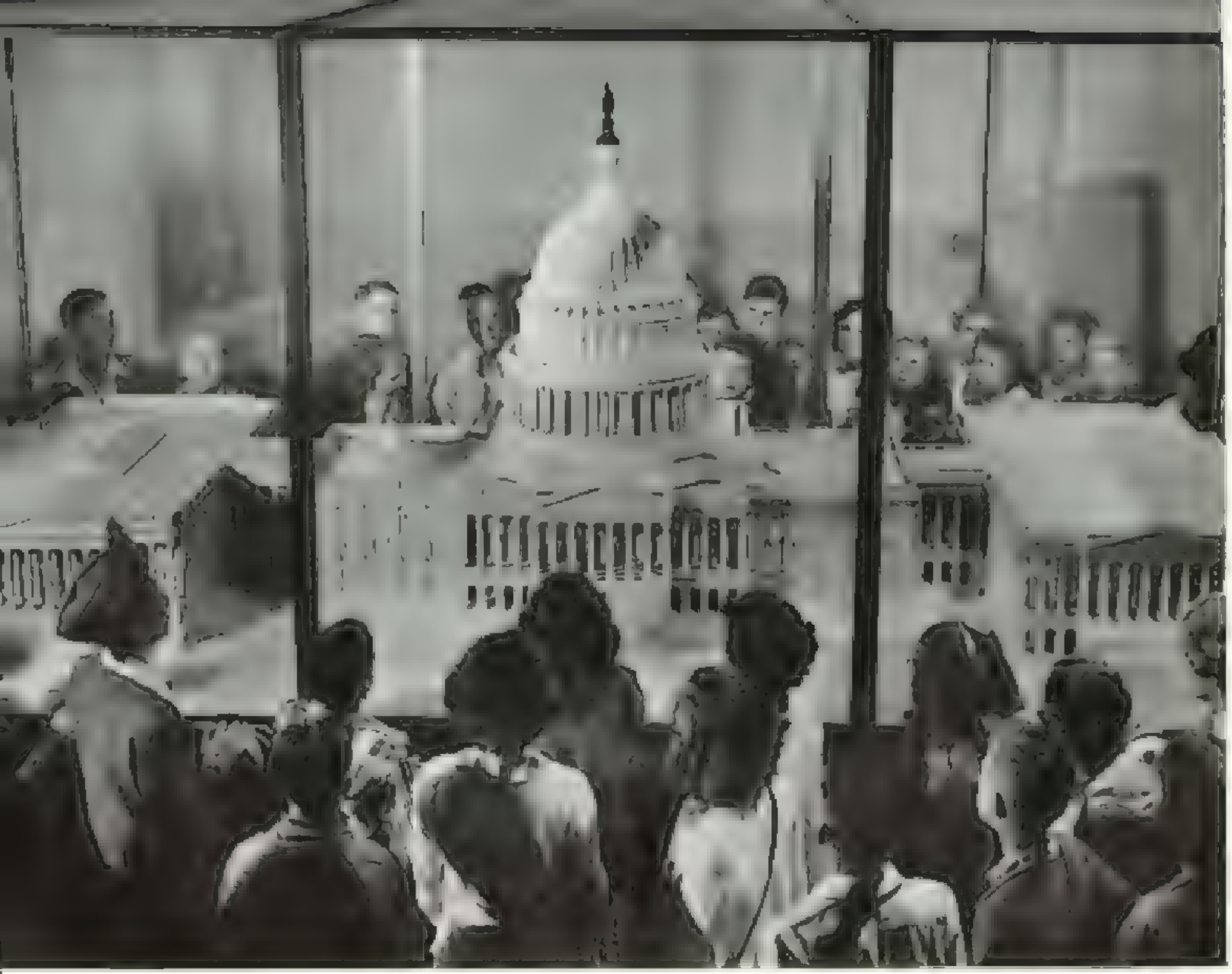




Visitors Form a Living Frieze in Small Rotunda

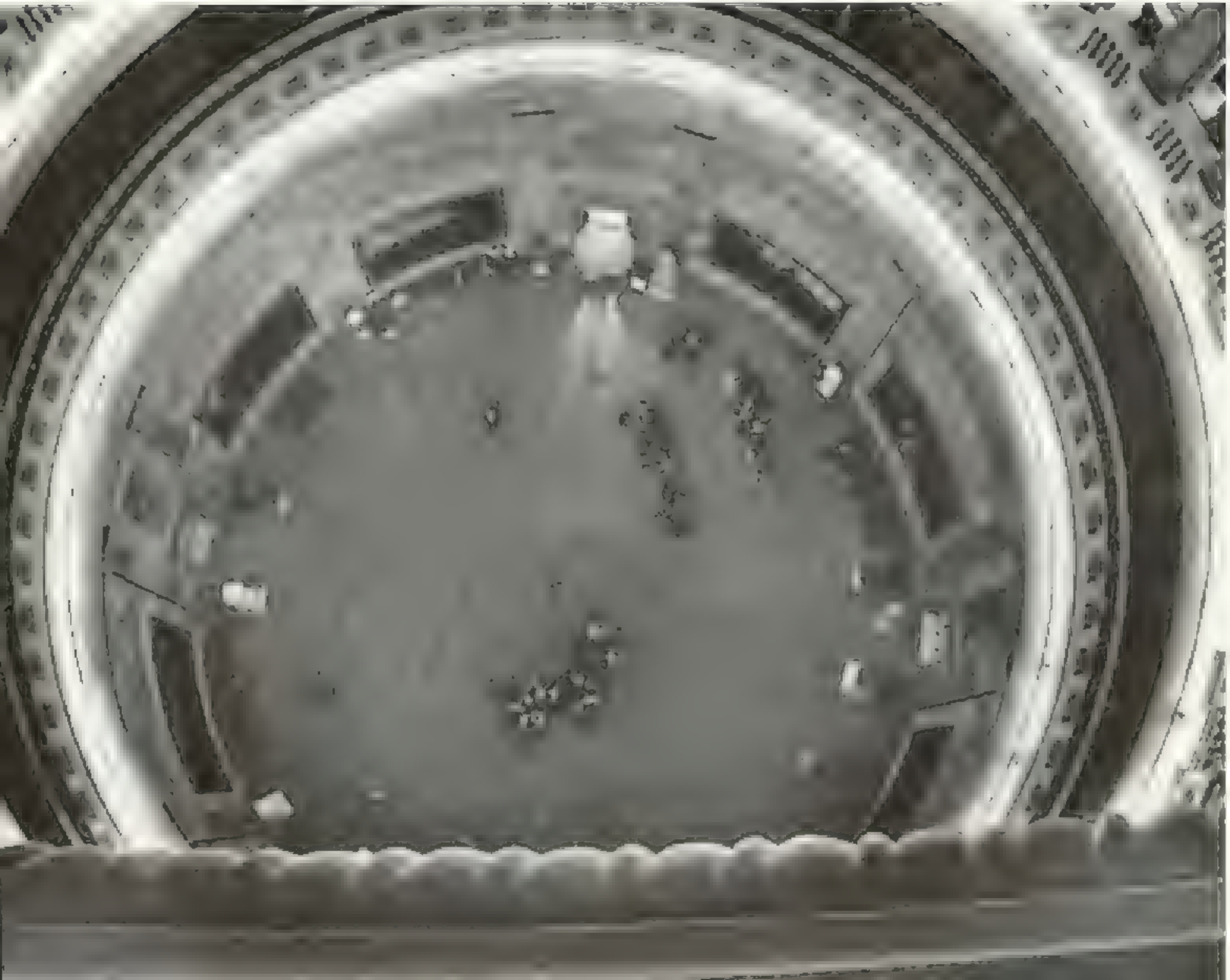
[illegible]

Cameras, Microphones, and Questions Bombard a Witness Before the Senate Crime Investigating Committee



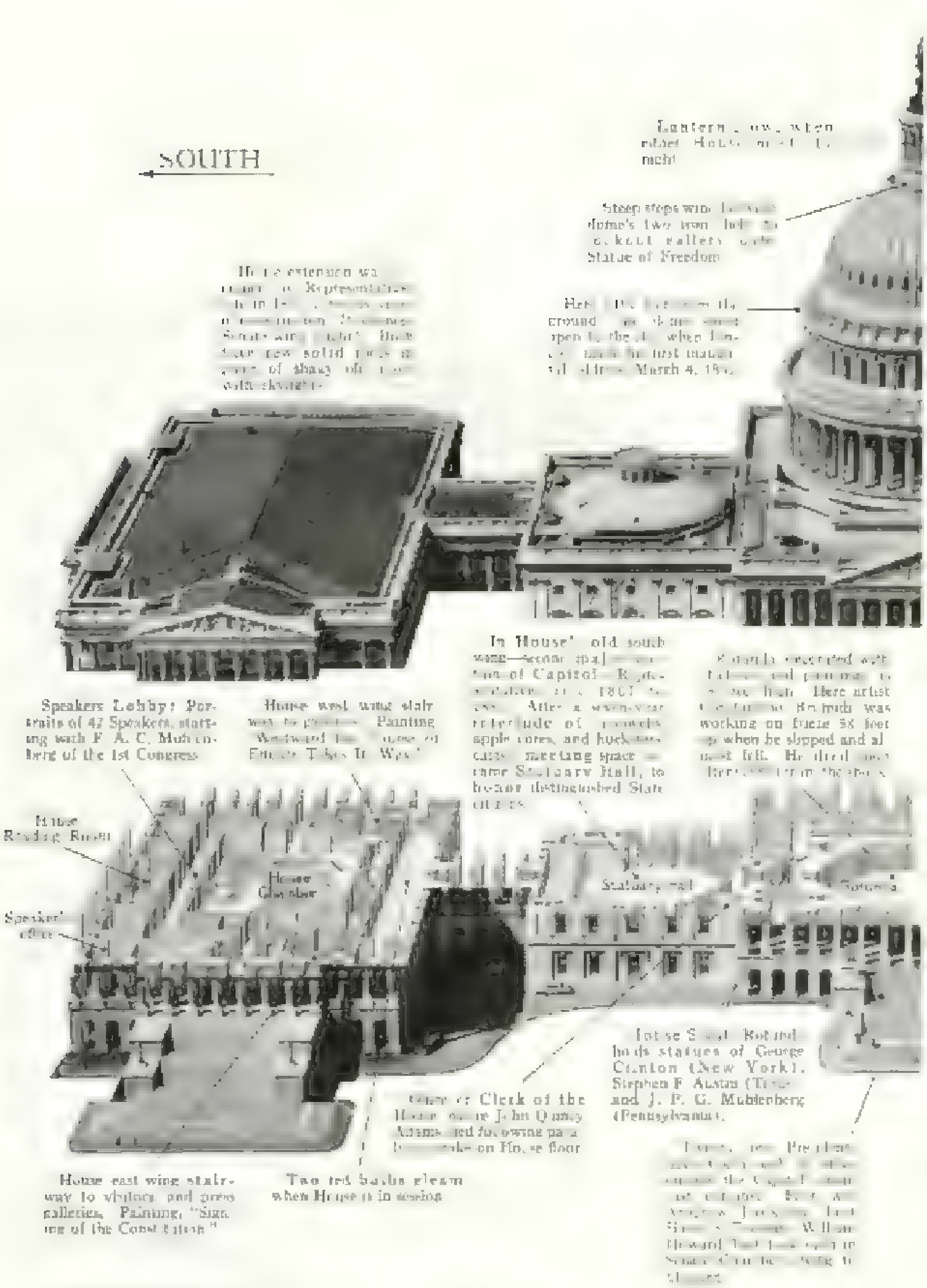
A Marathon Capital Enclosed in Glass Attracts Visitors

[illegible]



The Public Sees This View No More

Stairs and Balconies in the Dome Are Shut



Lantern [illegible] when [illegible] House meets [illegible] night

Steep steps wind between dome's two iron shells to a lookout gallery under Statue of Freedom

House extension was [illegible] Representatives [illegible] in 1857 [illegible] Senate wing (right). Both have new solid roofs in place of [illegible] old roofs with skylights

Here [illegible] ground [illegible] open to the sky when Lincoln made his first inaugural address March 4, 1861

Speakers Lobby: Portraits of 47 Speakers, starting with F. A. C. Muhlenberg of the 1st Congress

House west wing stairway to galleries. Painting "Westward the Course of Empire Takes Its Way"

In House' old south wing—scene of [illegible] of Capitol—Representatives met 1807 to 1857. After a [illegible] interlude of [illegible], apple cores, and hucksters' carts, meeting space became Statuary Hall, to honor distinguished State citizens

Rotunda, decorated with [illegible] and paintings [illegible]. Here artist Constantino Brumidi was working on frieze 58 feet up when he slipped and almost fell. He died [illegible] from the shock

Office of Clerk of the House, where John Quincy Adams died following paralytic stroke on House floor

House Small Rotunda holds statues of George Clinton (New York), Stephen F. Austin (Texas), and J. P. G. Muhlenberg (Pennsylvania)

House east wing stairway to visitors and press galleries. Painting, "Signing of the Constitution."

Two red bulbs gleam when House is in session

[illegible] President [illegible] the Capitol [illegible] Presidents Andrew Jackson, [illegible] William Howard Taft [illegible] in Senate Chamber [illegible]

A Photodiagram, Raising Dome and Galleries, Reveals History-making Chambers

NORTH

Senate [illegible] January, 1867, in the shadow of Civil War. During Reconstruction era the Chamber witnessed the drama of impeachment trial of President Andrew Johnson

Senate [illegible] Washington laid corner-stone in 1793. Barbecued [illegible]

Old small rectangular building (old north wing) was Capitol's first home. Crowded here after the Government moved from Philadelphia in 1800, [illegible] Senate and House, Supreme Court, Library of Congress [illegible]

Former Senate Chamber (c. 1850), later Supreme Court Room (1860-1935) [illegible] Senate met below [illegible] in area 1860 [illegible]

Senate [illegible]

Vice President's office

Senators' Reception Room

Senate Chamber

Senate [illegible]

President's Room, richly decorated, but its [illegible] used by Lincoln for signing bills

Marble Room, finished with Tennessee, Vermont and Italian marble as Senators' Reading Room

Latest [illegible] Atomic Energy [illegible] headquarters where [illegible] House in 1844 [illegible] his famous message "What hath God Wrought!"

White House [illegible]

[illegible] contains [illegible] and pre-[illegible] paintings. Painting on hand-[illegible] "Battle of Lake Erie"

The Capitol Covers 3½ Acres. It Grew by Bits and Pieces from 1793 to 1865

Bean Soup: A Must on Senate Menus

[illegible]

Senator Francis Case Shows Lincoln Head to Constituents

[illegible]

Congressional Pages Must Learn Their Lessons Before They Run Errands

[illegible] The Capitol Page School [illegible]

So skillful was he [illegible] that [illegible] along the [illegible] of four of the [illegible] corridors.

Starting in 1855 Brumidi painted through the administrations of six Presidents. His most successful achievement, the creation of the fresco figures that adorn the canopy of the dome, was undertaken and completed during the Civil War.

Like most of his work, the dome painting was accomplished through the medium of true fresco, the medium used by Michelangelo in decorating the Sistine Chapel of the Vatican. Brumidi himself [illegible] worked on Vatican restorations.

This art of true fresco is extremely exacting. It requires painting on freshly laid wet plaster by means of colors mixed with water. If any mistake is made during the process, the work has to be removed and started again.

I stand breathless close to the top of the dome in the highest balcony of the Rotunda and marvel at the [illegible] of the man. Nearly 180 feet above, my [illegible] purple robed mortal figure [illegible] I [illegible] reach up and almost touch [illegible] of [illegible]

It seemed impossible that one small man, perched on a [illegible] scaffold, could have covered those 4,664 square feet of [illegible] surface with [illegible] features of his [illegible] and carried out his designs through one of the most difficult of all art forms.

Recognition Long Delayed

Actually, Brumidi gave his life to the Rotunda painting. He was working years later, on the band encircling frieze below the dome canopy, when his chair slipped off the edge of the scaffold, and he hung [illegible] above the stone floor. He managed to [illegible] until rescue came [illegible] took the remaining strength [illegible] he died a few months later.

In Washington, D.C., recently, [illegible] spring [illegible] the [illegible] story [illegible] professionally [illegible] was one of [illegible] and [illegible] recognition.

A sizable audience was gathered there for the unveiling of a bronze plaque [illegible]

Painters Refinish and Repair the Capitol's Decorated Halls

[illegible]

Something's Always Breaking Down; Repairmen Keep Busy

[illegible]

Reporters Enjoy a Lull Between News Breaks on Capitol Hill

More than a thousand news gatherers are [illegible] the [illegible] Newspaper [illegible] Representative [illegible] House [illegible] William J. Donaldson, Jr. [illegible] the House [illegible]

voted by Congress to [illegible]. Statesmen, Washington officials, including the Secretary of the House of Representatives, and the Chaplains of Senate and House, were on hand.

But all eyes were turned to another figure on the speakers' platform—a tiny, [illegible] woman in a [illegible] suit whose [illegible] and a hat had become [illegible]

Myrtle Cheney Murdock, wife of Arizona Congressman John R. Murdock, had been [illegible] Brumidi's paintings since her first visit to the Capitol in 1937. She was [illegible] to learn that the artist had been [illegible]

A [illegible]

[illegible] in 1855 [illegible] of the [illegible] passages [illegible] 1950 [illegible] "American art on the Capitol."

The press recognition for the work of her hero, Mrs. Murdock set herself the task of searching out the obscure facts of his life, of finding his long-lost grave.

Eventually her research work led her to Brumidi's unmarked resting spot in Washington's Glenwood Cemetery. One day in 1950 she was pacing the [illegible] around it when a pretty girl came up and asked what she was looking for.

The girl turned out to be a great-granddaughter of Brumidi [illegible] wife, Lola Germon [illegible] estranged [illegible]

With [illegible] this meeting [illegible] Mrs. Murdock recently [illegible] book, *Constantino Brumidi, Michelangelo of the United States Capitol.* To what extent [illegible] persuasion brought about the belated congressional honor at the grave in Glenwood Cemetery is the lady's secret. During the ceremony

Speaker Sam Rayburn gave me full credit for the Nation's final acknowledgment of its debt to this "Citizen of the U. S."

But there is still one bit of unfinished Brumidi business at the Capitol. Today's visitors to the Rotunda often look up curiously at an uncompleted portion of the encircling frieze.

Soon after Brumidi's death, Congress engaged a second fresco artist, Filippo Costaggini, to carry out the half accomplished work, using Brumidi's original designs. This the artist did, but in the execution he squeezed his predecessor's panels and figures so that room was left for additional scenes of his own.

Congress rejected the suggested additions. Years later, still a third artist filled in part of the space, but the work was judged unsatisfactory. It is soon to be replaced by three scenes, for which Congress voted $20,000 in 1955. The subjects will be the "Civil War," "Spanish-American War," and the "Birth of Aviation in the United States."

Millions Tour Their Capitol

About a quarter of a million visitors every year take the official paid tour conducted by the Capitol Guide Service. Other unrecorded scores of thousands come in to wander around for themselves, to see their Congressmen, or to consult the building personnel on business of one sort or another.

"Our rush season is during the spring holidays," said Harry Nash, dean of the guide corps, who in 37 years of service has probably greeted more people than anybody else in Washington. "But we never have what you might call really blank spots in this business."

At all times of day I met the visitors tramping the long corridors alone or in groups: serious-looking middle-aged couples, sweethearts holding hands, and many children.

"Look, Daddy," I heard a little girl call out to her father as they inspected the Rotunda paintings. "The man has six toes."

Sure enough, a seated Indian in John Chapman's "Baptism of Pocahontas" has an extra toe. Whether the artist was careless or purposely painted one of Nature's slips is hard to say.

The Capitol's professional guide system, designed to give visitors an explanation of the building's chief features, is now 76 years old. It was born out of the near-chaos which resulted when hordes of sight-seers moved on to Washington from the Philadelphia Centennial in the summer of 1876.

Swarms of traffic were inundating the Capitol, and pickpockets and confidence men were taking advantage of the situation.

To meet the twin problems, Congress appointed five guides to organize and oversee the crowds while describing the Capitol's wonders. The service proved popular and slowly but steadily has grown through the years.

At present there are 24 guides, including 11 women. They are appointed equally by the House and Senate. Their pay comes from fees collected from sight-seers themselves—25 cents a head, with a 15-cent rate for school organizations. The price hasn't gone up yet.

Several marriages have developed from romances between the guides and tour patrons.

I heard of a former Congressman who stayed on as a guide for 12 years. One of the girls inherited an appointment held by her mother. And only recently death took from the ranks the veteran son of courtly and conscientious "Old Capitol" Benjamin Cady, an original member of the service.

Sculptor of Pioneer Suffragists Now 105

By law all official parties start in the Rotunda, go "to the Senate wing; lower floor through the crypt; to the House gallery, and back to the Rotunda."

In practice, however, the trips are as varied as the personality of the guides. Each has his own technique and favorite stops.

An attention-raiser in the crypt under the Rotunda is the group statue of three pioneer suffragists, Susan B. Anthony, Lucretia Mott, and Elizabeth Cady Stanton. This work has been dubbed, by the irreverent, "Ladies in a Bathtub," because it takes the form of three busts rising from a solid block of marble. It was carved by Adelaide Johnson, still living in Washington and planning to celebrate her 100th birthday in September.

"We find most visitors want to see their Congressmen in action," said one of the guides. "So we identify Members when we can, and explain that absence doesn't mean the lawmakers are not on the job. Most congressional work is done, of course, in committee rooms and individual offices." (page 1711).

Some of the questions asked by visitors show a woeful lack of accurate information on the Capitol.

"Does the President live here?" is a familiar one. Another went this way: "We've seen the House and Senate Chambers. Now where does Congress meet?"

The Floors Visitors Keep Out

On the House side two red lights outside the legislative hall are lighted when the Members are in session. The Senate uses a white light for the purpose, with an adjoining red one which can be turned on as a warning of closed executive session.

Actually, officials tell you, it has been years since the doors to the galleries of either Chamber were closed to those wishing to observe.

"Floor" privileges, however, are jealously guarded. During sessions, only specifically designated outsiders—depending on Senate or House rules—are admitted. These include the President, Vice President, Supreme Court Justices, Cabinet officers, former Members of Congress, Members-elect—and those special persons who have by name "received the thanks of Congress."

The galleries that look down on congressional deliberations are divided into sections. Some are open to the public (when provided with easily obtainable passes); others are reserved for congressional families, diplomats, or accredited members of news services.

The story of the press and the Capitol is one of long term struggle—with a happy ending. For this building now rates as a major and accessible news source for Washington and the world (page 180).

From the beginning, the public was generally permitted to watch the proceedings. Favored guests, including ladies, once even sat on sofas and chairs put up on the floor.

Pies, Peanuts, and the Press

A few privileged newsmen, starting in 1801 with Jefferson's friend and protégé, Samuel Harrison Smith of the *National Intelligencer*, were given reporting facilities either on the floor or in the gallery.

One of the early correspondents of the *Intelligencer* was still further privileged. He shared the sofa of the presiding President of the Senate!

It was not until the 1840's, however, that the right of the press as a whole to cover Congress at work was recognized. Official action then came only after passionate debate and after firebrand James Gordon Bennett had published scathing attacks in his *New York Herald* against Senate restrictions on coverage.

Eventually, a committee elected by the newspapermen themselves was given jurisdiction, under congressionally prescribed rules, over the admittance of bona-fide reporters to the press galleries. This is now the accepted system.

But, meantime, accommodations were often uncertain and sometimes sharply limited. Back in 1850, Washington's *Evening Star* published an editorial complaining that new rules were holding the press "to the corridors, which for the most part are occupied with telegraph instruments, peanut stands, tramps, pie women, and lobbyists."

Today, well over a thousand men and women, representatives of newspapers and magazines, radio and television, are accredited to cover "the Hill," as the Capitol is called in popular parlance. They may sit in House and Senate galleries and use the extensive working facilities provided in nearby offices.

Only about 200 of this news army are regularly on hand. When historic events are in the making, however, attendance jumps, and space must be carefully allocated. Such occasions in recent times have included three talks to joint meetings of Congress by British Prime Minister Winston Churchill (pages 162-163); the 1951 home-coming "our soldiers never die" speech of General of the Army Douglas MacArthur; and the address of Queen Juliana of the Netherlands in April of this year (page 145).

Many a tense and dramatic scene has been enacted before the galleries in both old and new halls of Congress.

Ex-President John Quincy Adams was suddenly stricken with paralysis in 1848 as he sat in the former House Chamber, now Statuary Hall. He died close by on a couch still preserved as a memorial in the room now used by the Clerk of the House.

In the old Senate wing, one of the most bizarre situations ever witnessed in the Capitol occurred during the impeachment trial, in 1805, of Supreme Court Justice Samuel Chase. In a most theatrical setting the Justice was acquitted.

Aaron Burr, the presiding officer, had provided accommodations for crowds of spectators and had had the seats his chair draped in scarlet in imitation of the scenes in Westminster Hall during England's sensational impeachment trial of Warren Hastings a decade before.

Stranger still, Vice President Burr, in solemn state at one the proceedings, was himself under indictment for murder at the time, as a result of the duel in which he had killed Alexander Hamilton.

Other high dramas played in the Chambers of Congress include the Senate's impeachment trial of President Andrew Johnson in the bitter post-Civil War days; and the April, 1917, address of Woodrow Wilson, made at the joint session in the House on the eve of the war declaration. That was the speech in which the President introduced his famous phrase about making the world "safe for democracy."

But not all the excitement in Congress takes place on the floor.

In the public gallery above the Senators one day in 1950, a veiled apparition in flowing

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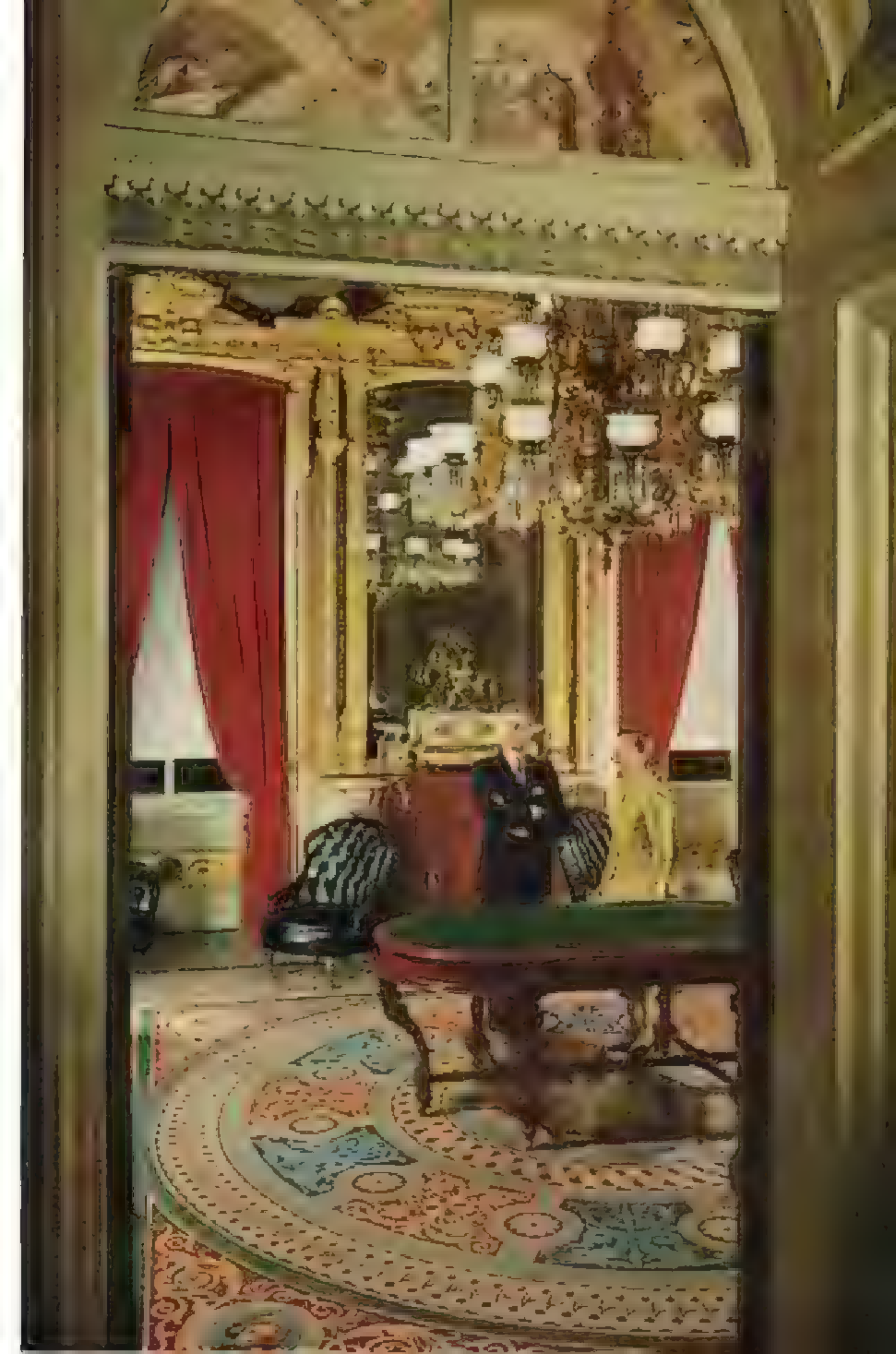
◄ Kodachrome by [illegible]

President's Room Captures Every Visitor's Attention

A gilt-framed chandelier hangs above a mahogany table on which many Presidents have signed bills beginning with Lincoln. Minton tile from England forms the floor's superb mosaic. Brumidi's American Vista looks down from the ceiling (pages 164-165). A Greene Reunion (in circular border) seems to follow visitors wherever they go.



Work Restoring the Vatican's Art Treasures Helped Give Brumidi the Classic Touch

[illegible]

[illegible]

[illegible]

[illegible]

Vespucius, Columbus, Franklin and Elder Brewster Represent Forces That Shaped America

[illegible]

[illegible]

Brunelleschi Completed His Masterpiece, the Dome's Frescos, in 14 Months

[illegible]

[illegible] Fourteen years [illegible] while working on [illegible] frieze below the [illegible] stopped. Catching a [illegible] fall on a scaffold [illegible]

[illegible]

Arts and Sciences. [illegible]

Wars. [illegible]

Agriculture. [illegible]

Mechanics. [illegible]

Commerce. [illegible]

Marriage. [illegible]

[illegible]

gray garments suddenly rose to her feet and began wailing like a banshee. Newspapers called her "the Phantom."

"The Phantom was no stranger to us," said Capt. Olin Cavness, of the 170-man Capitol Police force. "During debate over a military bill in 1941, before we got into the war, she chained herself to a bannister in the House gallery and started screaming.

"Under questioning she said she was a member of the 'Keepers of the Sacred Flame' and felt a compulsion to warn the world of its impending doom. She was committed on both occasions to a local hospital for mental observation, and later discharged."

On the whole, though, Capitol disturbances are rare. Police problems generally concern losses or petty thefts among the crowds or damage to works of art by souvenir snatchers.

Picketing of all kinds is prohibited by law within this building and its Grounds—one of the few public places in the country where this is so. Even wearing party campaign buttons here is banned.

Cogs in the Law Machine

Few of those who watch the formal proceedings of Congress are aware of the complex administrative and clerical activities that go on behind the scenes to keep the machinery of legislation in smooth running order.

Both Senate and House have their own separate working staffs, subject generally to the control of the political party in power. Officers of the House are elected or re-elected every two years, at the beginning of the new Congress. Officers of the Senate serve during "the pleasure of that body," because of the continuing nature of the Senate, which always retains two-thirds of its membership.

In a building where lawmakers' careers may be cut short after two years, many of these trained and valuable functionaries have held their posts for two, three, and more decades.

The congressional hierarchy is headed by the two presiding officers, the President of the Senate and the Speaker of the House. Two key administrative jobs are the Secretary of the Senate and the Clerk of the House. But there are also Parliamentarians, Sergeants at Arms, Doorkeepers, Postmasters, and dozens of other officials and subofficials whose knowledge of detail and tradition is essential in the carrying out of the Congressmen's numerous and often ritually prescribed duties.

70 Alert Blue-suited Pages

The congressional pages are, in a sense, Washington's youngest officials. These boys, from 14 to 18 years old, are selected by their Congressmen, with patronage committee approval. They run errands, distribute documents, and otherwise make themselves useful.

This session there are 21 Senate and 49 House pages; and it is a cheering sight to see one of them, in his standard blue suit, white shirt, and black tie, when you are lost in the mazes of Capitol corridors.

"Are you going to write about Congress or about us?" asked one of the boys when he heard I was gathering material for a NATIONAL GEOGRAPHIC article. "Hope you have lots of pictures," chimed in another.

The pages are paid $285.23 a month and are thoroughly versed in politics and cloakroom gossip. But they are by no means excused from the formal educational chores of other boys of their age.

In a congressionally sponsored school started in 1927, they study history, languages, mathematics, and similar college-preparatory subjects (page 178). Together with eight Supreme Court pages, they start classes at the formidable hour of 6:15 a. m., stay with the academic world until 10:25, then move on to the day's business where history is in the making.

One book which is not in the Capitol Page School curriculum, but which the boys as well as Members of Congress study and use constantly, is the annual *Congressional Directory*. Published from the Capitol building and prepared for and by Congress, this book [illegible] information concerning all Government activities in Washington. It is known to have been issued as early as 1809.

This year the *Congressional Directory* contains 737 pages and has had a printing of more than 55,000 copies. Members receive a specified number free of charge, but other thousands of purchasers, through the Superintendent of Documents, make this volume one of Washington's perennial best sellers.

It is not hard to understand why, in the light of the *Directory's* contents. Its pages include charts to the physical labyrinth of the Capitol building as well as a who's who guide to official Washington.

A still bigger publishing activity is the well-known *Congressional Record*. There is nothing quite like it in the world.

This daily report on all legislative meetings

[illegible]

◄ 97 Years Have Not Dimmed Brumidi's First Works in the Capitol

One of the first to introduce true fresco to America, the artist in 1855 completed Winter (above) and Autumn, two of the Four Seasons in the House Appropriations Committee Room, which in Brumidi's time belonged to the Agriculture Committee. Shadows skillfully introduced in "frames" and "moldings" make them appear as sculptured plaster, though all the work is painted.

of House and Senate has 531 'associate editors'—435 Representatives and 96 Senators.

High-speed stenographic reporters take down everything said during sessions. Until lately, some of the old-timers kept a tiny ink bottle strapped to a finger against sudden shortage.

But the *Record's* copy is not delivered to the Government Printing Office until it has been rushed to each Member quoted, for approval and 'revision of remarks.'

The lawmakers may also put into the appendix of each issue of the *Record* masses of printed matter of all sorts, from poetry to [illegible] statistics.

In [illegible], since 1947 a Congressional Bill Digest has been carried in the *Record*, providing quickly accessible capsules of information on congressional proceedings, committee work, and related data.

During the last session of Congress, more than 8 million copies of the *Record* were distributed. In all, they contained nearly a billion pages of closely printed material!

Home of "the Hermit"

Among all the words that have poured from the Capitol you look in vain for mention of its most mysterious and shadowy character—"the Hermit."

Until his death a few years ago, this man lived in an out-of-the-way workshop in the subbasement. He was fed from near-by kitchens and slept on a discarded door until sympathizers contributed a cot.

If Congress knew of the Hermit's existence, it gave no official sign; but many people I saw around the Capitol remembered him well.

"He was like something out of Disney," one of them told me. "But he must have seen better days. He was well informed and very fond of music. He particularly enjoyed the Marine Band concerts we have here in the summer in the Capitol Plaza."

When I learned about the Hermit, I thought I had heard everything. But there was still one more quest, a quest that led down winding dungeonlike stairs, through quiet passages, to a locked door.

"The tomb is directly under the center of the Rotunda," said my official escort as he opened the door and ushered me along a narrow hall to an iron-grilled barrier at the other end. "Of course it's a tomb in name only."

At this spot, I learned, Congress once had planned to raise a marble monument to George Washington and to transfer the General's remains here from Mount Vernon. The original project called for a circular opening in the floor of the Rotunda, from which visitors could look down on the memorial below.

The plan failed to materialize. For one thing, Washington had asked in his will that he be buried at Mount Vernon. Though Martha Washington rather reluctantly agreed to the move, with the provision that her body also rest in the Capitol beside that of her husband, eventually the Washington heirs decided against it.

Rotunda Scene of Mourning

Through the iron gateway I saw a glass-enclosed catafalque, or bier, draped in black cloth. This badge of mourning is not for the man who rests at Mount Vernon but for all those chosen to lie in state in the Rotunda.

The catafalque has been used thirty 12 times, beginning with the grief-laden hours when endless lines of silent people moved past the body of Abraham Lincoln. Others who have lain there in state under the dome were Thaddeus Stevens, Charles Sumner, Garfield, John A. Logan, McKinley, the disinterred remains of L'Enfant, Admiral Dewey, the Unknown Soldier, Harding, Taft, and General Pershing.

"I saw the last five of these ceremonies," said chief guide Nash. "Most impressive to me was the time when the Unknown Soldier was here in 1921. A boatload of flowers came over with him from France. They were banked high along the walls and brought down in the form of a cross. Their sweet, heavy scent was almost overpowering."

At such times, when the Capitol overflows with humanity, it seems more than ever to belong to the people. But whether the citizen is in Washington, D. C., or in Washington State, his presence is always felt in this building. Its business, after all, is everybody's business.

Here, with few interruptions, all the Nation's laws have been enacted from 1800 to the present.

These statutes, which have guided the country's growth and rising power through ever-changing conditions, have reached the impressive total of nearly 70,000. Each session brings more to affect the life of citizens everywhere today and tomorrow.

In my wanderings I encountered in the old Senate wing a strange time-and-event juxtaposition. Congress's Joint Committee on Atomic Energy has its headquarters in the very room where Prof. S. F. B. Morse in 1844 ticked off his famous message, "What hath God wrought!" for the formal opening of Washington's first telegraph line.

"What our committees of the future will be concerned with is anybody's guess," one old-time Capitol employee remarked. "All I'm sure of is that they will have to deal with the same old human nature—and the sound of the human voice."

High Adventure in the Himalayas

By [illegible]

ON [illegible] return to Scotland my friend [illegible] had spoken to us [illegible] in the highest [illegible]

As he talked, his words [illegible] that climbed [illegible] and bamboo with amazing [illegible] unclimbed [illegible]

Now [illegible] had come with a plan. [illegible] the [illegible] of strange [illegible] the ring of adventure—the Kishi Ganga [illegible] the Garhwal.

Cost? We would have no expensive [illegible] Simplicity were the [illegible] We could live cheaply off the country.

We would [illegible] the area of the Lower-Nanda Devi, where it forms a great [illegible] India in the districts of Garhwal and Almora (map page [illegible]) [illegible] as the most beautiful region of the whole 1,500-mile chain. Opportunities for the mountain explorer ranged from unknown [illegible] to giant clusters of unscaled peaks [illegible] 20,000 feet [illegible]

[illegible] Bhotia tribesmen, [illegible] honest semi-nomads, a people of great [illegible] They would sell us native food [illegible] the Nepalese Bhotias would help transport our gear.

Give Up Security, Chose Mountains

Now [illegible] time to go. We had [illegible] for the [illegible] years we had been climbing [illegible] under 40. It meant [illegible] security of good jobs, but we chose [illegible] we took the [illegible]

[illegible] was on our [illegible] Don MacKinnon and Bill Murray. The two men we would have chosen from any company, were [illegible] MacKinnon is a pharmacist; Murray an author.

Our party had a combined experience of more than 80 years of British and Alpine mountaineering. More important, we were well known to each [illegible] Scottish Mountaineering Club [illegible] and [illegible] means

a lot when men must live together for long periods of isolation.

By mutual consent we appointed Bill Murray organizer. We had barely two months to prepare. Each of us was given tasks.

Scott made detailed climbing plans. On the basis of them, I worked out food and transport needs.

Staking the success of the expedition on local supplies, I decided to take a mere 440 pounds of food for five months. The main items were dried eggs, dried milk, pemmican, sugar, cheese, jam, chocolate, sweets, biscuits, dried soups, butter, and, of course, tea.

Tom MacKinnon was responsible for medical supplies—an obvious bit of casting.

Murray combed his friends and associates of the Alpine and Himalayan Clubs, without whose help and good counsel we could not have moved. He coordinated our efforts, showing a remarkable flair for administration.

Not knowing a word of the language was considered a minor difficulty; we could learn it as we went along. We Scots have an old saying that with a good Scottish tongue in your head you can go anywhere.

Heights a Heaven after Plains

The man who said it is more pleasant to travel than to arrive has certainly not crossed, in the dust and glare of midsummer, the 1,200 miles between Bombay and the first surge of the central Himalayas. It was a joyous moment when the green foothills reared above the haze—real green, like a memory of Loch Lomond's woods in a desert. In the wilting heat of May, India's hottest month, the parched plains cried for moisture.

We were glad to forsake the railway for a bus that zigzagged upward, climbing steeply through jungle to terraced fields. Wherever water could be brought, potatoes and rice showed a rich green.

Mounting steeply, we came upon lilacs and exotic flowering shrubs. From green banks by the roadside, wild flowers sprouted in profusion. Now and again we had to wait for sacred gray langur monkeys to cross the road.

After the plains it was delightful to feel the hot wind grow gradually cooler. At Ranikhet, 6,000 feet up, storm clouds were discharging the first rain we had seen since leaving Glasgow.

Morning saw me out on the lawn in my pajamas. Beads of rain sparkled on flower and tree.

Ahead, crest after crest of jungle foothills caught low slanting sunrays of gold. Incredibly far above them, like silver writing in the sky, soared peaks so unearthly that at first I could not believe I saw them. Those wondrous shapes were Nanda Ghunti, 20,700 feet; Trisul, 23,360; Nanda Devi, 25,644; Nanda Kot, 22,510, and a peak recognizable as our first objective, Betharuli Himal, 20,840.

Was it possible that we might tread these silver tops, the very throne of the gods? I could not believe it, but cried aloud for the mere joy of seeing.

Dotials Eager to Serve as Porters

When we sought porters—called coolies here—21 Dotials from Nepal were lined up before us by their headman, Kuar Singh. Superficially, they were a criminal-looking band, with their ropes and ragged hoursputs (page 193), but we liked them instantly, and it was rather pathetic when the rejected refused at first to leave the line. But our needs were modest and four of them had to be left behind.

Our porters carried 80-pound loads, including 20 pounds of their own supplies and gear, for three rupees (about 63 cents) a day—four for mountain work. They furnished their own food, mostly flour from which they made chapattes, or thin pancakes. Loads were borne by headbands over the brow (page 200). We carried 20-pound loads in rucksacks.

For the next 10 days we were on the march, along over high ridges on fantastic paths, leaping down to rivers, crossing huge bluffs, and plumbing a wild ravine. From the pass of 12,140 foot Kuari Pass, we descended 6,000 feet to Tapoban (page 230).

At many of our camps MacKinnon had to open his dispensary as natives heard the news that white men were around. One almost blind old fellow expected his sight to be restored, and declared it to be so after swallowing a few tablets. Later he returned with his goat to have iodine applied to a wound in its hairy throat.

Wherever we went the natives were friendly. Puffing enormous hubble-bubble pipes, or spinning raw wool onto bobbins as they walked, they followed us for miles. They wore homespun trousers tight on the legs, with a blanket fastened over their shoulders in the manner of a Scottish plaid.

Already our porters had shown themselves to be men of sterling character. They were natural climbers and willing workers. Scots and Dotials understood each other, though we could not speak a common language. All hands were enjoying themselves.

Betharuli Beckons

From Tapoban we headed for almost four-mile-high Betharuli Himal, our first objective, by way of the Rishi Gorge. The country we were entering now was incomparably wilder than anything we had seen—a fierce tangle of rock spires split into two tremendous gorges,

Scratching His Shoulder, a Dancer Imitates a Monkey Bitten by Fleas

[illegible]

the Dhauli and Rishi by the [illegible] this mountain [illegible]. [illegible] We camped on the ridge at 12,[illegible] feet, [illegible] from the snow [illegible] situation. Up here, little [illegible] we walked [illegible] of rock. [illegible] slopes and [illegible].

[illegible] tomorrow [illegible] in darkness with the report that the [illegible] was difficult. It was! It took us five hours to climb [illegible] feet.

We [illegible] the lower Rishi gorge [illegible].

What would [illegible] men [illegible] of the porters [illegible] the Rishi. We [illegible] the baggage and [illegible] [illegible] it [illegible].

Nanda Devi an Icy Goddess

The strain was telling on the porters. One [illegible] the rarefied air of 14,000 feet. [illegible] the [illegible].

Ahead, above the rock walls of the Rishi rose Nanda Devi. All other mountains we had ever seen were insignificant beside the "Blessed Goddess." [illegible] like this [illegible] head almost five [illegible] feet [illegible] round.

Incredible that such a [illegible] could [illegible] looking at the [illegible]

Thomas Nagel

Wary Explorers Skirt a Glacier Crevasse near Their Doorstep in Punch Chuli

Unscalable ice barred the Scots from reaching Punch Chuli's 22,650-foot crest (pages 199, 234). Camped on the [illegible]

of the south ridge, we took off our caps to H. W. Tilman and the 1936 Anglo-American expedition for their fine performance in climbing it. To my mind, the feat still ranks as the greatest of all mountaineering achievements.

By the time we reached the gray flood of the Kish, 13 porters had been paid off, but the remaining six worked furiously to throw a log bridge across (pages 218-19).

Size 6 Fits Everybody

After the crossing came more hard climbing, but at last we stood at the foot of Bethartoli, our mountain. Nearly 9,000 feet above us, high above a welter of hanging ice, loomed the peak we hoped to climb. From here we could see no safe route to the top. The danger of avalanche was all too apparent.

In planning the expedition, we had bargained for three porters coming high with us, and accordingly we had purchased boots, sleeping bags, and high-altitude clothing for them. Now was the time to present them, and the porters were as delighted as children at Christmastime.

All but the sleeping bags had been bought at Glasgow Barrows, a kind of "Hawkers Bazaar" in Gallowgate, where you can buy, at cutthroat prices, anything from a wooden leg to a pair of long drawers. The boot size was a pure gamble, but acting on advice we had chosen size 6. We prayed that they would fit.

Beaming all over, Zungin, Gloria, and Matbir tried them on. They fitted.

Food was our main worry. That man-load of flour lost meant that our climbing time would have to be cut by six days, leaving only five for reconnaissance and getting to the top.

Ascending to 14,000 feet next morning, we

Earth's Mightiest Peaks: the Himalayas Tsair Nuse Means "Abode of Snow"

saw that a route from the north ridge must take the line of a protective rock rib, for otherwise we were liable to attack from an artillery of huge poised blocks and tottering pinnacles of ice. We decided to pin our faith to this rib in the hope that it offered a route to the summit. That same day we brought porters and tents to 14,500 feet.

The reward of being up there came at evening, when the clouds that had lain on the high tops all day suddenly spilled off. The red sun, breaking through, lighted a ring of monstrous peaks that shot like needles to more than 20,000 feet, peaks with challenging names like Changalang (22,320 feet), Kalinchu (22,740), Rishi Kut (20,400), and various others unnamed (pages 202-3).

There was snow on the ground when we rose at 5 a.m. and started up the ridge. Loose and stony at first, it crossed a snow gully, then steepened to rock, demanding use of hands as well as feet. In 2,000 feet the

ridge narrowed to an arête, or sharp edge, of snow, corniced on one side, with a little gendarme, or rock tower, blocking the way.

The coolies had climbed magnificently, though troubled by altitude. At about 17,800 feet we decided it was unfair to ask men unused to Alpinism to go further. With many salaams they departed for the lower camp.

Chasm Defends Bethartoli's Crown

Bad weather was closing in, so MacKinnon and I cut platforms for the tents in the snow of the narrow ridge, while Murray and Scott reconnoitered.

Back they came with bad news. Ahead yawned a 100-foot gulf impossible to climb down. We could have fixed the rope and slid down, but we could never have returned the same way.

To get over this nasty shock we crawled into the tents, got the stove going, and melted snow for pemmican soup and tea with biscuits.

Eating brought on breathlessness, and even to turn in our sleeping bags made us gasp like newly landed fish. Plainly we were not yet accustomed to the heights; a dull, persistent headache proved it. And, although we were reasonably warm in our eider-down bags, our breath froze on the tents, falling in the form of powdery snow.

Bitter as the cold was our sense of frustration—blocked by an impassable gulf when only 3,000 feet from our goal.

But our spirits rose with the morning sun. To be here in this glistening world was the ultimate reward. Far below lay the forest, steep-walled enclosing the Rishi. Up here the rock, snow, and ice were alive, the tip of Nanda Devi shooting like an arrow above the tiny tents on the crest of the ridge.

Because of loss of that week's supply of flour, there was insufficient time for another attempt. Thus Bethartoli beat us.

But our failure had taught us a few things about Himalayan climbing, camping at high altitudes, and our reactions in the rarefied air. It had given us a new appreciation of scale, without which no one can climb so cosmically in the Himalayas, for what appears from afar to be a tiny nick in a ridge can turn out to be a virtual chasm, precisely the kind of thing that stopped us on Bethartoli.

The lessons were to be rubbed in. Rising above the Rishi, the 19,910-foot peak of Hanuman, the "Monkey God," had taken our fancy.

All went well until we were less than 1,000 feet from its summit. Then, to our intense disappointment, we were stopped at 19,000 feet by another cut-off similar to the one on Bethartoli but deeper.

In fast-falling snow and thick mist we had an anxious time descending. It took so long that we finished in a race with the gathering darkness. We steered by compass, little ex- [illegible]

Suddenly in the gloom we smelled wood smoke, and with twitching nostrils followed it to camp. By carrying up juniper wood and keeping a fire going the porters had saved us from a night out.

Listening to the blatter of snow and wind as we lay snug in our sleeping bags, we not only blessed our Dotial friends but gave thanks for the precaution of taking a compass bearing back to camp in the morning when it was clear enough to see its direction from the peak.

Next day we headed back to our base at Tapoban. It was a journey done on short rations of rice eked out with wild rhubarb, curtailed nibblings of chapattles, and a modicum of butter, cheese, and pemmican. We had native beans, but these proved so damaging to our internal economy that not even the porters would eat them.

Winding down to Tapoban, we were sorry to be descending to 6,000 feet among the flyridden haunts of man, but glad to be nearing a food dump.

June had come, and in two weeks we had jumped from winter to spring. Snow gullies that had troubled us on the ascent were shrunken beyond recognition, and hosts of new flowers were abloom—forget-me-nots, wild garlic, sweet peas, and whole hillsides of yellow broom.

Over the gorge soared a Himalayan golden eagle, much like the bird we see on Scottish hills. The voice of the cuckoo had come to the Rishi; flocks of snow pigeons twisted over the crags on silver wings; and Himalayan bulfinches occupied the upper tree line. Tree pipits were performing their flights of love.

On a Dizzy Trade Route to Tibet

The next phase of the expedition, timed to take place before the arrival of the monsoon in early July, was reconnaissance of the Lampak Mountains from the south. Our way lay up the Dhauli Gorge, one of the great trade routes of the central Himalayas and a track to Tibet (map, page 197). Where the Rishi had been grand, this was austere, for few trees grace its steel-gray walls of rock (page 208).

The track wound along these walls, high above the rushing Dhauli River. In some places it hung suspended in space, supported [illegible] iron stanchions driven into the rocks. No doubt they had been put there by the British when they administered this area, for it was their responsibility to keep the passes open.

Traffic was heavy on this highway. Nomads were lugging their household effects; some carried bens in baskets. Curiously clad

Mendenhall Glacier Tumbles down the Pinnacle Chain Range in a Welter of Riven Ice

[illegible]

A Porters En Route to the Top of the Wood Bridge Through Baijnath Valleys in the Hills of Kumaun. Packs Weigh 80 Pounds

Sunset's Fading Gleam Enablazons the Crags above a Shadowy Chasm; Raging Pass

Spumy Clouds Drift Like Snow · Chongdongza Mike Granite Suggests a Shark's Tooth

< Porters Steady the Vacher Cassette, a Shiny Locale above a 386-foot Drop

[illegible]

v Dancers Court Gods of Fertility

[illegible]

A Rhododendron Tree, Growing Wild at 12,000 Feet, Sprinkles Red Blossoms Against a Background of Eternal White

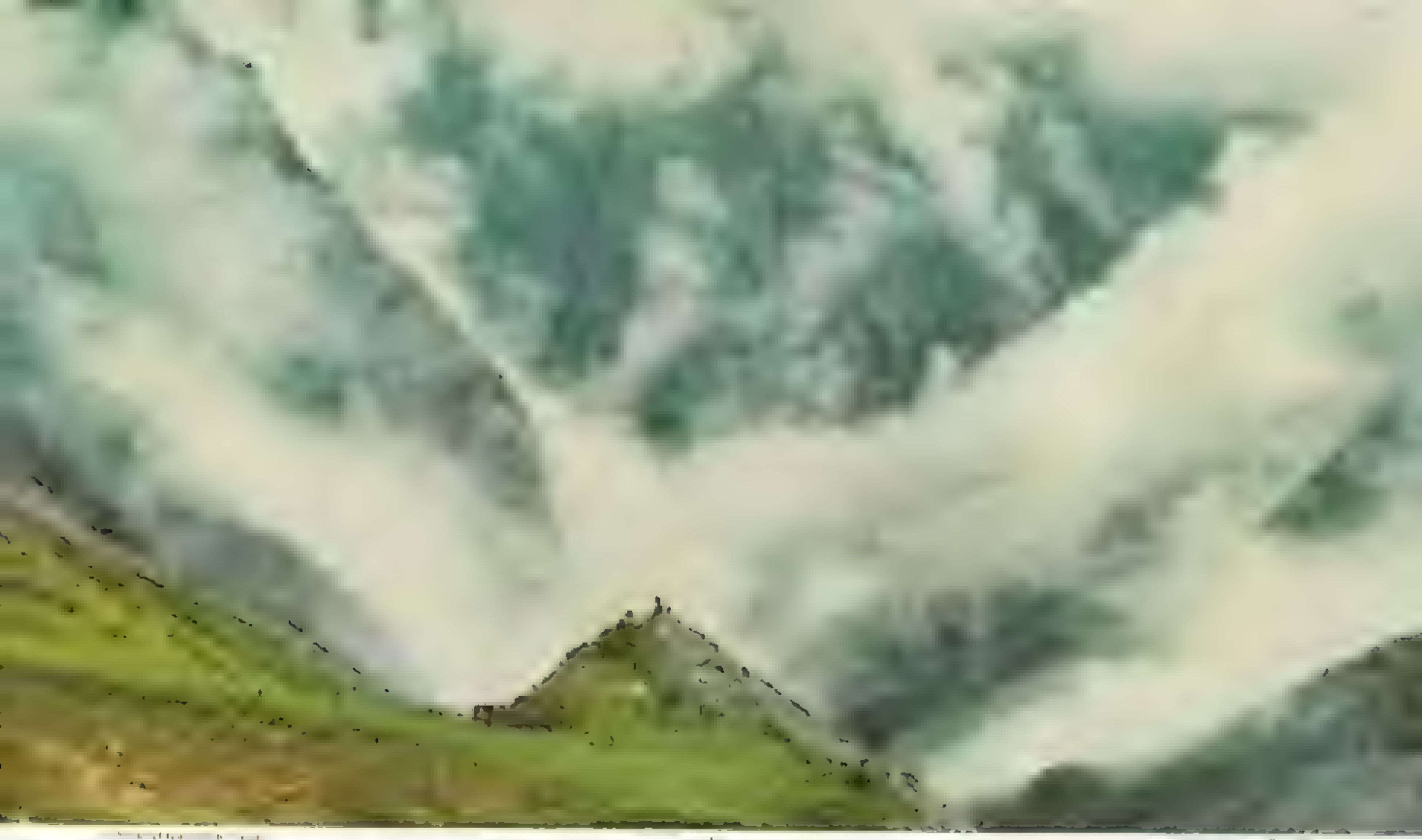
Tibetan Traders Drive Their Goats down a Cliffside Trail in Dhauli Gorge

[illegible]

Each Sturdy Goat Carries 24 Pounds of Provisions in Balanced Saddlebags. This Was the Scots' Pack Train

A Glistening Ice Curtain Three Miles Long Hangs from the Crest of Tirsali

Tents Stand in a 15,000-foot Meadow; Alpine Flowers Star the Ground



Monsoon Clouds Swirl Around Mountain Flanks above India's Darrangarga Valley. Pictures (Left) Survey a Cauldron of Mist

India Looks Toward Tibet's 19,000-foot Peaks Across Mile-deep Girthi Gorge

Tibetans, wearing ex-army bush hats, colored woolen boots, and black coats, herded sheep and goats, each animal fitted with small saddlebags containing salt or borax.

The sheep would be sheared here in India. Then back the patient Tibetans would go, bearing their barter—Indian rice or wheat, or manufactured goods.

These Tibetans are solemn men, but give them a smile and their faces nearly split in half with welcoming joy.

Climbing up a side ravine to reconnoiter a route to the Lampak Mountains, we came to a most beautiful village situated on an alp. Its stonework and finely carved wooden balconies were the best we had seen. But to our surprise the place was entirely deserted.

We found out why when we climbed 3,000 feet higher to Dunagiri, a village of Bhotias, perched at 11,800 feet above a glen of wild roses, walnut trees, and sweet-smelling shrubs.

Bhotias Migrate Like Birds

Bhotias, like the birds of the Himalayas, have different life zones, occupied according to the season. Many tribes have three villages, the highest being close to the Tibetan border, for Bhotia means "Man of Tibet."

These people are traders. From their high summer homes they journey far into Tibet, carrying grain and rice, or other goods, to barter for salt, borax, or trinkets. Like Tibetans they use sheep and goats as pack animals.

When the two-months' trading season is over, these birds of passage journey down to autumn quarters. Forgathering in the lower valleys, they hold their traditional [illegible]

Winter's approach sees them in their lowest homes, whence many journey to the plains to buy goods for next year's trade.

Such a life breeds self-reliance and a great knowledge of mountains and men.

The people of Dunagiri greeted us with smiles of pleasure. Many were red cheeked and almost fair skinned.

When we asked if we could obtain food bowls of atta (native flour) promptly appeared. Then potatoes! They were a Scottish variety known as Arran Banners, but of a quality I have never seen in Arran or elsewhere. It appeared that they had been introduced into the hills by the former British administration to better the lives of the people.

At this altitude the potatoes took twice the normal time to cook, but they tasted even better than they looked. Replete, we toured the town.

In a little square the village school children squatted, slates on knees, while an ancient pundit put them through their lessons (pages 207 and 234). After meeting us and drawing the class to attention, he pointed to my pockets. He wanted to see what was in them—for educational purposes.

The old teacher proceeded to give the class a lecture on my belongings, each item being greeted with cries of joy. He took evident pride in showing his familiarity with such things as watch and compass, but was completely stumped by my exposure meter.

Wherever we went in India we saw new schools being built. One was going up here. The villagers were well dressed. For best, the men wear homespuns consisting of tight trousers with matching jacket of semi-European cut. The dress of Bhotia women, however, is rather baggy and unbecoming. Ornaments range from silver girdles, anklets, nose rings, and earrings to charms of bear claws (pages 217 and 228).

At Dunagiri, ailing residents were brought to us for treatment. The worst case was a little girl whose lower leg and foot were black with gangrene and swollen with pus. MacKinnon at first despaired of her life, but his penicillin had the child well on the way to recovery when we left.

Later we were shocked to discover that many of the people in this area have venereal disease, and that tuberculosis is rife among them.

Unfortunately, too, they are much addicted to a form of rice spirit that is very near to raw alcohol. Locally, it is called chang (the same word used for the milder Tibetan beer), and it seems to result in a lowering of physical and moral standards.

Despite this, however, we found the Bhotias the toughest of travelers and the happiest of men when we had the good fortune to get them to work for us.

From Dunagiri we made two climbs that gave us our first success in pioneering new ascents. The first was a rock-and-snow [illegible] of 17,850 feet; the second a 16,090-foot rock climb to a knife edge of granite.

A brief view from the latter through boiling cloud layers showed that the Lampak Mountains could not be climbed from Dunagiri. Uncompromising ice walls offered no hope of ascent from this side.

Dance Honors Gods of Fertility

Leaving Dunagiri, we headed for the north side of the range to have a look from there. With us were five huge pack animals called jhibus—crosses between yak and cow—and our faithful six Bhotias.

Our fears of an early monsoon were strengthened when we came down to Malari village in the upper Dhauli. To hasten the [illegible] were being honored by six Bhotia men and

Bhotia Tribesmen Clip Fleece from Shaggy Tibetan Sheep

[illegible] this [illegible] Malari [illegible] [illegible] [illegible]

one woman wore a long [illegible] [illegible] green [illegible] silk, and [illegible] [illegible] resembling [illegible] than they [illegible] [illegible] [illegible]

The [illegible] [illegible] watched the dancers [illegible] [illegible] [illegible] [illegible] present and [illegible] [illegible]. [illegible] clockwise pattern around the fire, [illegible] through the m[illegible] [illegible], or picking up handfuls of earth which [illegible] let trickle through their fingers. Sometimes they touched their foreheads with grain or earth, rubbed their brows with charcoal from the altar, or [illegible] [illegible] [illegible] them. All the time [illegible] [illegible] of the same women.

[illegible] woman danced a solo. With her [illegible] [illegible] swinging [illegible] about her shoulders, she threw her [illegible] [illegible] [illegible] her face [illegible] [illegible].

Malari is a vertical village [illegible] [illegible] vertical [illegible] [illegible] [illegible], like [illegible] boulders one above another.

That Malari [illegible] [illegible] with people was shown by the [illegible] [illegible] [illegible] narrow streets. [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]

[illegible] [illegible] reconnaissance of the unexplored [illegible] [illegible], we left Malari [illegible] [illegible] [illegible] the [illegible]

[illegible] [illegible]—3 Bhutias, 6 [illegible] [illegible] and 18 [illegible] [illegible].

Climbing to [illegible] feet across the snow [illegible] of the [illegible] Dhura pass, we [illegible] [illegible] masses of wild flowers—[illegible] primulas, yellow [illegible] [illegible] and [illegible] other brilliant [illegible].

[illegible] we dropped [illegible] glacier and camped [illegible] a huge waterfall [illegible] peak [illegible] [illegible] feet. Clouds [illegible] [illegible] [illegible] ledges.

[illegible] [illegible] sweeping downward to [illegible] splinters; we knew [illegible] to show from [illegible].

Accepting the mountain's [illegible] challenge, we [illegible] three [illegible] for [illegible].

By [illegible] every [illegible] from the [illegible] and [illegible] [illegible].

A Dunagiri Girl Wears a Nose Ring Bigger than a Bracelet

Bhotia [illegible] postal [illegible] [illegible] [illegible]

Unfortunately, our [illegible] were feeling the altitude. One was [illegible] and the [illegible] were going very slowly. [illegible] to the men that they carried to 17,[illegible] feet to pitch our tents some 600 feet [illegible]. [illegible] base; the other three stayed with us.

Wild Mountain Sheep Share He[illegible]

Tom MacKinnon had made [illegible] reconnaissance of the [illegible] and reported [illegible]. He had [illegible] [illegible].

We [illegible] [illegible] of bharal—wild mountain sheep—appeared at heights equivalent to our own.

From our camp the scenic contrast was startling. On the Indian side, from north [illegible] [illegible] hills, their [illegible] decked with patches of snow.

[illegible] have been [illegible] sky ever had [illegible] electric [illegible]. We were [illegible] plateau, stretching [illegible].

Wave Cloud Pack ▪ Photo: Inches Across the Rashi on a Sounder, Qinghai Lake

A Rope Hundred Acts Between Glacier Waters Swell the Mighty Stream

[illegible]

Zungia Models His Handiwork, a Wool Sweater

The Dotal porter fashioned the yarn with a hand spindle while carrying his pack. Using homemade needles, he knitted by campfire [illegible] three sweaters. Though elderly, Zungia proved to be the ablest porter.

When night had come to the valleys, high peaks still burned with sun glow.

Breakfast in a high camp is not a jolly affair. Getting out of a sleeping bag is not so bad as the business that precedes it. [illegible] biscuits and lukewarm tea down one's throat, the latter from a flask filled the night before. Boots and other preparations seem a rather jumbled nuisance at such times, and it is a brave man who will say anything controversial.

At 5:30 a.m., with this behind us, we set off with two ropes. Tom MacKinnon and I shared one, Bill Murray and Douglas Scott the other. Clouds enveloped us.

Crossing a Wall of Ice

Above 18,000 feet the trace quickly narrowed to a knife edge calling for care. Soon we saw that we must traverse an ice wall and press on overhanging [illegible].

At such times it is reassuring to have a good anchorage on the mountain, such as a well-driven ice ax with a turn of rope [illegible]. A slip by the [illegible] can then be checked [illegible] be secured that [illegible] this case a few inches of [illegible] in the ice [illegible]. It looked woefully insufficient with a drop below of thousands of feet.

But MacKinnon led confidently. Cutting into and footholds, he moved across the wall stopping midway to ask me if I was quite happy. He told me he was fairly enjoying himself.

[illegible] foot outward Tom swung himself [illegible] ice on the far side, out of sight. Five minutes passed and then I heard his cheery cry to come on.

At 19,000 feet we required two breaths to every step. [illegible] crossed a second [illegible] wall, worse than the first, and plodded onward, driving each foot carefully into the narrow [illegible].

Suddenly a fragile blade of snow loomed ahead—the 20,450 foot summit of Uja Tacne! It was snowing as we crowded onto its narrow top, to look down ice walls disappearing into glow.

In such a situation one does not feel a c[illegible] quite the reverse. The climb had taken eight and a half hours, and we were going to need all available time for the descent. Besides, it was too cold to linger.

Anchored Rope Saves All Four

On the way down our safety [illegible] proved their worth, for an ice step broke under MacKinnon's weight, shooting him down 4[illegible] feet before he was pulled up by the rope. Without first anchorage, in rock this time, we all probably would have been pulled off.

Almost unnoticed at first, a minor miracle was taking place. The mists that had enveloped us all day were submerging to the valleys,

[illegible] made us forget the bitter cold.

In waves of [illegible] [illegible] peaks were [illegible] [illegible] [illegible] [illegible] [illegible] wedge of sulphur [illegible] against the [illegible] clouds.

Even as we looked the warmth was withdrawn from the sky. The rolling clouds [illegible] to shadow. The immensity of depth, of incredible space, is something I am never likely to forget. It [illegible] a feeling of being [illegible] on the earth, but [illegible] planet.

The [illegible] that [illegible] tools and [illegible] had not only submerged the clouds, but had given us a clear sky. From it now shone a three-quarter moon to light our campward steps. We [illegible] the tent just 18 hours from the time we left it. Cat[illegible] [illegible], no one was hungry, though we had eaten little all [illegible]. Altitude has strange effects.

A Bavarian Gr[illegible] Spins Wool at Milan

She pulls the [illegible] out to the whirling bobbin. Gradually [illegible] power a treadle turning the bobbin and winding the yarn. Most [illegible]

Next morning the sun shone warmly on the tents. It was delightful, but not for MacKinnon. He was snow blind, and the tent had to be darkened to give him relief for his eyes.

In the [illegible], [illegible] had [illegible] much trouble [illegible] [illegible] [illegible] 24 hours.

Meanwhile we prepared for another attempt [illegible] peak we called [illegible] seemed a fair hope of climbing it. We [illegible] in deep [illegible] 1,000 feet to pitch our tents.

Wall Creepers Seem Huge Butterflies

Around our [illegible] 15,000 feet, pink and yellow flowers were so thickly massed that we couldn't avoid trampling on them. All about us were rosy birds [illegible] mountain finches, pipits singing their songs [illegible] lovely thrush-like bird of [illegible], afterward identified as an unclassified species of grandala. Alpine choughs [illegible].

Most beautiful of all was a wall creeper fluttering its gray and crimson wings like some huge butterfly as it clinbed a vertical cliff [illegible].

We [illegible] and could find a camp at more than 18,[illegible] on the [illegible] an icy snow cornice with long drops on [illegible] side. The summit was less than 3,000 feet above. Ahead was an [illegible] barrier [illegible] deep but not capable [illegible] ping us, we thought.

Came the hour of rising for the attempt, 5:30 a.m.—and we had to withdraw to our sleeping bags. Wet snow pattered against the tents, and visibility was nil.

There was nothing we could do but lie up and watch puddles form on the tent floor. I read the Gospel of John while avalanches roared off the peaks, falling down each side of us.

Pinned down, we could do no more than wait, enduring the coffinlike discomforts that small tents impose. The second night passed like an age.

Now it grew colder; ice encased the guy ropes. The mountain was in no mood for climbing. We shouldered the packs, roped up, and descended 5,000 feet.

Five days had been spent on this attempt, but there was time for another try. Once again we camped on the snow cornice under the 800-foot cliff, and once again foul weather developed overnight. But this time we came to grips with the crags in an attempt to force the peak.

To our disgust the rock was mere shale, so rotten that it came away in handfuls. There was no choice but to cut steps back to camp and pack up.

Into the Girthi's Scenic Savagery

Now we came to what promised to be the most exciting phase of the expedition, the traverse of the Girthi Gorge.

Our route lay across the flank of Uja Tirche, through flowers that filled the air with their fragrance. Now we would be tramping through a haze of vivid blue rock geraniums or bright red potentilla. Then we would be brought to a halt by saxifrages clustering among the rocks, or dewdrops sparkling in the tiny blue eyes of pincushion mosses.

On this fresh morning, the Himalayas of imagination had come to life. From the crest of the Girthi pass we took our last look at the peaks that had been our companions for the past three weeks. They cleft the air like knife blades. Could it be that we had camped up there among those ice fittings so delicately poised on the blue-black sky?

When we took the plunge into the Girthi, it was like heading into another world. This was a vegetationless world, a world of naked rock that rose sheer on the north side 7,000 feet from the river (page 214). On our side the wall of Uja Tirche sent down a great buttress to make the most impressive ravine we had seen, a Grand Canyon of the Colorado on a more vertical scale.

Yet, for all the arid prospect, there were flowers at our feet as we rounded the first bluff, flowers that found foothold in stones. There was even a thistle like our Scottish one, and roses that grew in a bower over our heads.

In this incredibly wild country, we were amazed to find an attempt being made to establish a settlement. It consisted of two thatched houses, built, we were told, by Malari Bhotias with the pioneering spirit. They had even built two little shrines, about the size and shape of dog kennels.

The menfolk were away from home, but there were two attractive women who smiled with bad effect on our men.

On this Girthi crossing, we had expected difficulty with glacier streams, but none held us up unduly. The main trouble with Himalayan rivers is that the boulders on the bed are moving with the rush of water. The correct technique is to charge through. To try to balance across is to be swept away.

At the Border of Tibet

By the fourth day we were through the gorges, and in mist and rain we climbed into the snow and stones of the Untu Dhura pass at 17,640 feet. We had reached the border where northeast lies Tibet and southeast lies India.

In this desolate place we heard, of a sudden, the jangle of bells and the wild cries of drivers. Streaming out of the mist came dim forms of yaks and sheep driven by Tibetans who stopped in their tracks to stare at us. They wore robes of blue and scarlet, and all carried knives or swords as protection against bandits. For the next few hours caravan after caravan passed over this bleak height.

(At the time of our visit, the Communists had not yet taken over Tibet.)

Our men had done well on the climb. They did even better on the descent. Next day we strolled into Milam, the first village in India. Its millet fields and neat squares of houses gave it the appearance of a Promised Land—and that is what it must seem to Tibetans after the hostility of the high passes.

At once we were greeted cordially and conducted through courtyards piled with saddlebags, where Tibetans lounged and Bhotia women wove carpets on ground floor. Local people were eager to introduce us to another European, Leonard Moules of the Worldwide Evangelization Crusade. He had hoped to carry Bibles to Tibet, but permission had just been refused him.

Len had been doctoring the natives for the past six weeks, sometimes dealing with as many as 100 cases a day. Right now he was about to remove a cataract from an eye.

Drums Announce a Farewell Party

Milam was the turning point of the expedition. MacKinnon's time was up, and sorrowfully we said goodbye as he left with one porter for the long trek to Ranikhet.

For us, money was running short. The last phase of the expedition, reconnaissance of Panch Chuli, 22,650 feet, would need to be

After a Jungle Trek, All Hands Relax in a Camper's Fly-free Paradise

[illegible]

Aquatic Cooks Brew "Hound" Lasting Stews, Dried Soups and Beverages

[illegible]

1 Porters March
across a Grassy
Canopy in
Dzanga-Ndoki Valley

[illegible]

2 Bigilo Scouts
in Mud under
a Waterfall

[illegible]

Drummers Beat a Ceremonial Rhythm as Yansu Village Bids the Explorers

Murray (left) and Scott Occupy Seats of Honor in the Texas Senate

A Bhotia Woman Doing Her Chores Wears All Her Beads

[illegible]

Dancers Sway to a Fiddler's Tune

[illegible]

Modern Sequoias Forming Woodlands Clothing the Slopes at Topanga

[illegible]

done in the monsoon. It was now mid-July. We could not afford to wait for the clear skies of September.

Moules, too, was leaving, and a farewell party had been arranged in his honor; the sound of drums announced it. Standing on roof tops and crowding the narrow streets, the whole population turned out.

In the center of it all were the musicians and two rather attractive singers. The band consisted of an instrument like a piano accordion and a sort of rectangular violin. They struck up as we arrived (page 229).

With swaying bodies and sensuous movements of the hands, the girls managed to get the maximum of sexual excitement into their simple song. Their concession to the dance was in little shuffling steps delivered with a tap of the shoe.

Sword Dance Gets Dangerous

Then the sword dancers took a hand. "Dancers" is a misnomer. The swords were merely brandished and whirled about, though one man tiptoed in neat steps. The other swordsman made fierce and comic faces.

Sometimes the music stopped, and the comedian would deliver a pantomime, sending the crowd into roars of laughter at his funny faces. Almost literally sidesplitting was the climax: In his antics he sent his sword whirling through the crowd, cutting open a couple of heads.

The appearance of Moules with his laden jhibus was the signal for the procession to move forward. A garland of flowers was hung round his neck; the girl dancers swayed around him, and musicians and drummers played more furiously as they wavered through the village to mount the rail which marked the beginning of his journey. Villagers, old and young, streamed behind.

The finale was a tremendous tattoo from the drums, rising to a crescendo and ending with the crack of gunfire. In the granite silence that followed, Moules took his departure for the bleak northward passes.

Our own departure came soon after. With Bhotias from this wealthy village helping to carry our kit, we started for Panch Chuli, our last great mountain objective. The approach we had chosen was the Rakam Pass, really a succession of three passes crossing the main Himalayan range at 18,470 feet.

It was good to walk 10 miles down a glen similar to many in the Scottish Highlands on a misty day—swift running water, with glimpses of craggy ridges as the clouds boiled.

The path was turfy and fairly flat, curling into fields of flowering millet where Himalayan greenfinches and goldfinches spurted. Red-billed choughs replaced the alpine choughs of Milam; rufous turtle doves inhabited the trees, and wagtails flitted by the streams.

A climb of 5,000 feet took us over the first pass, then down to Rakam village, 3,000 feet below. Its inhabitants seemed to suffer from sore heads, sore tummies, sore eyes, and a host of other complaints. We dispensed medicine to the needy, but the malingerers were quickly identified and sent packing with a halibut liver oil capsule.

Our visit was such an occasion in this remote place that when it came time to leave at 7 a.m. a procession was formed in our honor. Heading it were the boys of the village.

In farewell the kiddies plucked handfuls of flowers and danced with a bouquet in each hand. Finally each gave a solo in the center of a ring. One imitated a monkey scratching for fleas; another made funny faces; still others flung themselves about, whirling fiercely in true Highland fling style (page 195).

The second pass was harder than the first, over a glacier and up a rock saddle to drop to the Yankchar Glacier. We camped on flat stones near a couple of snow bees.

At more than 15,000 feet in this Arctic wilderness, it was a surprise to see a fox, fawn colored and with an enormous brush of lighter color.

Moonlight flooding the tent awakened me. In the incredible silence, the peaks stood clear of cloud, silvery above vast shadows. I find it impossible to put into words the mood of these mighty peaks, all of them unclimbed.

Porters Pull Wool Over Their Eyes

The men were in great form next day, competing with each other in cutting steps across a snowy icefall. We merely followed, marveling how sure-footed they were in such an assortment of footgear—sandals made from rubber tires, sneakers, unoiled leather shoes.

On the upper glacier we were worried for their eyes, for we could issue only a few pairs of goggles. They produced wool, teased it out, and pulled it over their eyes.

On the other side of the pass, our men sat on their loads and sledged down, whooping at the rush of speed.

At one point, boulders hurtled down toward our last three porters, but they ran hard and escaped with nothing more than a fright.

Soon now we were descending steeply to a more verdant land of rhododendrons and stunted birches, of blue-fronted redstarts, rufous hedge sparrows, rubythroats, and rosefinches.

The valley floor of the Lesser Yankti seemed impossibly far down, but at length we were beside it. In a couple of miles we saw ahead the village of Sepu, a cluster of houses perched above neat terraces of pink and yellow grain amaranth (page 201).

A Porter Buys Wheat Flour at Tapoban for the Journey Through Rishi Gorge

[illegible] with [illegible] and [illegible] to [illegible] limited amounts of tinned food.

Here several women came to us to show [illegible] powder. [illegible] Think [illegible] kind of skin [illegible] Murray painted [illegible] with [illegible] paint, a deep purple [illegible] which the ladies [illegible]

Hot Coals for a Stomach-ache

[illegible]

[illegible] We [illegible] the room. It was pitch [illegible] was [illegible]

[illegible] The whole [illegible] [illegible] We had [illegible]

[illegible] the [illegible] We have [illegible] It was pitch [illegible] was [illegible]

[illegible] mountain [illegible] a rope and a warm [illegible] to the [illegible] We had [illegible] shattered [illegible] For [illegible] the [illegible] We [illegible] two [illegible]

[illegible] the [illegible] Nepal. Tonight we did not [illegible] to [illegible]

Next day we climbed, through a maze of crevasses, far enough to assure ourselves that we were not being merely chickenhearted. Stones falling continuously showed our judgment had been sound.

Fresh conditions of snow flurries and enervating heat alternated until sunset. At times we found it so hot on the glacier that we filled the crowns of our hats with snow and were forced into the tent for shelter from the fierce sun. Yet three hours later, when the sun had set, my feet were cold in three pairs of socks.

That attempt disposed of the north col approach. An examination of the south col showed that if Pauch Chuli can be climbed it will be done from there.

Back at our valley base village of Yansu, we prepared for the 150-mile trek out to civilization. But first we were invited to a celebration in our honor.

At 8 the next morning we were ushered into a house and seated on a carpeted dais. A wall of Bhotia faces pushed nearer and nearer to us as fifty and more newcomers squeezed in from behind. Not knowing the language, we could do no more than smile and murmur "*thik*" (right), politely.

Toasts and Brown-paper Cigarettes

It was a relief when brown-paper cigarettes were handed round. None of us smokes, and you need to be a smoker to smoke a brown-paper cigarette. Also, you require a strong pair of lungs to prove to commission.

We puffed and coughed and were glad when a basin of gray liquid arrived. Our hosts filled three little silver cups and handed them to us. Saying "cheers" to the multitude, we drank. It was supposed to be milk, but it didn't taste like it. The cup was promptly seized and refilled.

Then chang made its appearance. It tasted like vinegar and burned with inspiring fire.

Under its influence I was invited to play an instrument like a piano accordion with a little bellows attached. My attempted rendering of "I Can Wash a Sailor's Shirt" was foiled by broken keys. Only two notes appeared to be working. Playing those two, one of the Bhotias intoned a monotonous chant like a snake charmer's.

From outside came drummers lined up to accompany us down to the village square. There we were seated on carpets while the drummers began a long litany (pages 226-7).

It was so long that I decided it was time we gave them something in return. The crowd stood around expectantly while I collected the drums in a semicircle. Wielding a couple of big sticks, I beat out rhythms fast and furious, but my art appeared to be lost on them. They looked baffled rather than amused. Nevertheless, had there been a spare drum I would now joined the band that marched us back to camp.

Down to a Hothouse Atmosphere

Next day we were off, down a wooded glen that cut deeper and deeper, becoming a ravine on a tremendous scale (page 224).

After the bleakness of the other two Tibetan trade routes we had seen, this one was a revelation. Tropical vegetation, langur monkeys, banana palms, sunbirds, and hothouse atmosphere showed how fast we were losing altitude.

It was exciting one day to round a corner and look on a green wall, scored by rock gullies, rising to a sea of forest that disappeared in the gray of monsoon clouds. We were on the western border of Nepal. Looking into that forbidden country.*

It was a wild path, crossing under waterfalls, climbing like a staircase in places, at other times spanning drops on wooden planks; a narrow gangway contouring a complication of rivers and foothills.

Five days down the Darmaganga we were able to buy mangoes, ripe bananas, and sticks of tall Indian corn for roasting. At Darchula we had to wait for the torrential rain to subside and let us resume our journey.

We were lucky to beat this rain by one day for the track we had descended was now made impassable by landslides and rushing torrents. We had found these streams barely fordable the day before. The consequence of a slip in the thigh-deep water would have been to go over falls and perhaps to land in the roaring glacier river below. None of us had ever seen such a terrifying rush of water.

As we neared Almora the route led over a succession of jungle ridges, none of them above 6,500 feet and some considerably lower. Butterflies swarmed on the paths—large swallow-tailed varieties as big as a warbler; smaller varieties went about in whirlwinds, dancing madly and settling like closely scattered petals. The humid air was strong with honey scents.

Birds were everywhere—kingfishers, bulbuls, red-billed blue magpies, shrikes, flycatchers, spotted forktails, black headed sibia, crested hawk eagles, pigmy owlets, drongos, and an amazing variety of pigeons. It was a naturalist's paradise. Once I interrupted a bear hunt but to the disgust of the hunters I had no gun. With clubs, spears, and dogs, they beat the undergrowth.

Holy men en route from Tibet to India

* See, in the National Geographic Magazine, "Nepal: A Secret Paradise," by S. Dillon Ripley, January, 1950.

Bhotia Children at [illegible] Study Their Lessons Outdoors

[illegible]

were [illegible] We [illegible] together.

[illegible] the pres- ent [illegible] the climate [illegible] good. [illegible] between men and the Gods.

[illegible] God, [illegible] a Hindu God or a Universal God. [illegible] question. [illegible] the Himalaya [illegible]

One morning [illegible] Panch Chuli [illegible] of the clouds. [illegible] we had [illegible] Now it appeared [illegible] world of [illegible] peaks [illegible] over the [illegible] of [illegible] forest ridges.

A [illegible] we had [illegible] weather has been well [illegible]

The Poison of the Heights

The [illegible] in the [illegible] We [illegible] the [illegible] and [illegible] to [illegible] physical [illegible]

[illegible] the revelation of [illegible]

Notice of change of address for the NATIONAL GEOGRAPHIC MAGAZINE *should be received at the offices of the National Geographic Society by the first of the month to affect the following month's issue. For example, if you desire the address changed for your [illegible] number, The Society should be notified of your new address not later than [illegible] 1. Be sure to include your postal-zone number.*

Back-yard Monsters in Color

Even in a Great City, the Insect Kingdom Reveals Its Shimmering Hues to a Hunter Armed with Patience and Kodachrome

By Patt A. Zahl

NEW YORK City may seem a strange place for starting a natural-history project. But it was amid Manhattan's walls that I discovered the fascination of an unusual form of hunting—hunting insects with a color camera.

The project stemmed directly, but not fortuitously, from bird photography. In a downtown Manhattan pet emporium I was taking color pictures of tropical birds when all at once an immense brown cockroach appeared on the perch.

As Broadway would put it, he stole the scene. On impulse I trained my lights and lens on the insect instead of the bird.

The picture proved successful enough to open my eyes—and my shutter—to a colorful kingdom that is all about us, even in such a city as New York.

Insect Colors Rival the Birds'

Hidden under leaf and bough, beneath the ground, and in the nooks and crannies of man's own habitations, lies this unseen, living world of color, to most of us unknown and often unsuspected. The splendor of the miniature, almost secret, teeming world of the insects is largely concealed from human eyes, even though it exists in intimate contact with the world of men.

A fleeting glimpse of a fluttering butterfly's gay wings, the brightly spotted carapace of some beetle scurrying to a hide-out, or perhaps a green grub chewing voraciously upon the leaves of a cherished shrub or tree, is all that most people ever see of insect colors.

The occasional "bug" that crosses our path, the hungry housefly, the singing mosquito, the honey bee sipping at a clover blossom, even the hordes of grasshoppers or army worms that may devastate field or garden, give hardly a hint of the glamour of the insect world.

Yet actually no living creatures, except perhaps the birds, rival the infinite variety and delicate loveliness of the insects' rainbow hues.

Capturing insect color with the camera is no easy task. To obtain the 27 color photographs reproduced on pages 239-246 and 251-258, I exposed about 3,000 Kodachromes. Of these, 130 were used in making the final selection. Many were made no further from home than my own back yard.

One warm afternoon last summer I was at work in my research laboratory, a block from the great new United Nations center in New York, when my wife phoned. Our four-year-old daughter [illegible] the garden with her hands and arms full of bristly, red-headed caterpillars. They were all for me!

Little Efie had listened to our dinner-table conversation and knew of my new interest in insect collecting. Now she was trying to help.

When I reached home, I found that the caterpillars were larvae of the tussock moth. They were about an inch and a half long, each with four tussocks of white fibers bristling up off the back and with tiny bundles of hairs standing out elsewhere. Good color subjects, they had red-enameled heads and two scarlet spots on the back (page 245).

Insisting that I go with her to the source of her find, Efie led me out into the garden which hangs over New York's East River Drive. There on the cherished apple tree were hundreds more of the caterpillars.

By now I was less inclined to rhapsodize over the gaudy good looks of these guests than to grieve at what they were doing to the garden trees. Not only were the leaves of the apple tree being gnawed to lace, but so were those of the maple.

In ensuing days I noticed how the greenery in other little gardens and mews of Manhattan's East Side was aswarm with caterpillars of the same sort. The iron railings in near-by river-front parks were busy caterpillar avenues. The summer of 1951 had brought to New York City an especially severe infestation of the destructive tussock moth, a member of the family that includes the notorious gypsy and brown-tail moths.

With my young daughter, I watched and studied the voracious eaters in action.

Miracle of Caterpillar-into-moth

Each caterpillar, after it had grown fat on our trees, became sluggish and finally settled in a branch crotch to weave a cocoon from silk mixed with its own pincushion bristles.

Then, deep within the cocoon, one of Nature's great miracles would quietly take place. The tissues of the sleeping caterpillar would break down and reform into new ones wholly different.

Finally, toward the end of summer, a small, drab moth would emerge from each chrysalis. Only the male can fly; the female moth is practically wingless and must remain crawling about on the branch where she was born, waiting for a mate to fly to her.

Guinea-pig Helpless Due to Science to Test the Effectiveness of Insecticides

Bureau of Animal Industry, U. S. D. A.

Mosquitoes Refuse to Lay Eggs Unless Fed on Blood, the Scientist Obliges

Mosquitoes [illegible] U. S. Department of Agriculture posts to and Esso Standard Oil laboratory experiment [illegible]

The almost [illegible] with a bit of fruit. Thus [illegible] the winter and hatch a new [illegible] caterpillars in spring just as [illegible] [illegible] with [illegible]

The [illegible] other specimens [illegible] Manhattan [illegible] [illegible] are count for more.

At first it seemed a bit foolish for a curiseller to select insects as a photographic [illegible] ject. The [illegible] summer, and for a while I considered moving to some more rural spot in the South.

Then I learned that [illegible] and described [illegible] than 15,000 species, representing almost every known family of [illegible] in the State of New York alone. [illegible] away, with so copious a supply [illegible]

To supplement my [illegible] I ventured across the Hudson River over into the garden counties of New Jersey. Here [illegible] insect [illegible] have been [illegible] cornfields, [illegible] and flower gardens of New Jersey [illegible] [illegible] for collectors [illegible]

When Bees Swarm on a Jet Fighter, Even the Marines Take Cover

[illegible] [illegible] [illegible] Beetle Kit.

At [illegible] point [illegible] Newark from New York [illegible] in New Jersey. It had 48 acres of woods and meadows that had [illegible] and had [illegible] unsuspected. The place was alive with insect [illegible]. Wh[illegible] there to collect?

I was grateful for the [illegible] and [illegible] the local [illegible] exterminator. I was [illegible] specimens [illegible]. I [illegible] them due to their natural surroundings.

[illegible] and August when my assistant, Andy Nowak, and I arrived [illegible]. We set [illegible] old barn [illegible].

We could tell [illegible] that we had [illegible]. Everywhere butterflies flitted, bumblebees buzzed, grasshoppers jumped, ladybirds [illegible] mantises prayed. It was insect [illegible].

A Mouse Makes Good Beetle Bait

There are [illegible] techniques for collecting insects. The simplest is merely to walk through a meadow, [illegible] net from side to side across the tops of the [illegible]. The theory is that many a bug is [illegible] unseen on the underside of leaves and grass blades. When disturbed, they fly or hop or just fall groundward—and so into the net [illegible].

The trouble [illegible] that [illegible] way [illegible] everything. It [illegible] (page 98) [illegible]

Beware The Look of Wide-eyed Innocence! Greedy Grasshoppers Have Ravaged the Earth

[illegible] Short-horned Grass-hopper [illegible]

- **Bulbous "Nose" Between Biting Jaws Is Really the Long-horned Grasshopper's Upper Lip**

  [illegible] **Long-horned Grasshopper** [illegible]

- **Short-horned Grasshoppers** [illegible]

A Paper Wasp Feasts on a Thistle's Nectar. Hooked Antennae Identify a Male

Early [illegible] wasps found feasting in [illegible] of the Paper Wasp. Hummingbirds through [illegible] [illegible] Nectar [illegible] and shared into a pulp

A Furry Bumblebee's Long Tongue Probes Deep for the Nectar in a Thistle

A [illegible] **Bumblebee** [illegible] Unlike the smaller [illegible] Bees [illegible] repeatedly. [illegible]

A furry black and yellow bumblebee has a deep gap [illegible] to female flowers, the bee [illegible] corn crops. The bee [illegible] to pollinate. [illegible] weed pick up pollen.

Leggy, Nightmarish Praying Mantises Are Man's Allies in the Insect Wars

[illegible] **Praying Mantids** [illegible]

[illegible]

Lepidoptera Pests Wear Hard Brown or Coarse Stripes

The Tussock Moth.

[illegible]

▲ Carpenter Ant Carves Its Nest in Wood

[illegible] the Carpenter Ant [illegible] old buildings. [illegible] but [illegible] damage [illegible] and windows [illegible]. Carpenters are the largest [illegible] North American ants. [illegible]

▼ Exposed! A Member of the Underground

[illegible] Scarab Beetle, [illegible]

249) find themselves in close quarters in the net. The struggling specimen is likely to [illegible] before they can be removed or separated.

Even so, the method did produce astonishing results. A few minutes of net sweeping [illegible] yielded us several praying mantises, [illegible] and [illegible] [illegible] times.

Another obvious method is to spot your butterfly and chase it [illegible] from flower to flower. This has [illegible] [illegible] but [illegible] It should [illegible] [illegible] [illegible] ence of potentially beering friends.

Still another common technique involves [illegible] the branch of a flower shrub and [illegible] an open net of cloth [illegible] death to catch whatever falls. It is recommended that the shaker wear a hat.

Insects may be lured by various odors, and many moths can often be attracted by lights. Others, however, are repelled by light, and this provides the basis for still more collecting devices.

To try the odor technique, we brought along from New York four dead mice carefully wrapped in wax paper. These were to be [illegible] bait for scavenger, or burying [illegible] of exquisitely colored creatures that few people ever see, although they are found the world over.

These dwellers of the twilight either live underground or hide from sight so securely that [illegible] traps must be used to bring them out. They lay their eggs on decaying animal matter, and one way to capture them is to plant a piece of putrefying meat or the carcass of some small animal almost anywhere on the [illegible].

Within a few hours, especially after dark, the beetles are drawn by the smell. They [illegible] go to work excavating beneath the carcass, [illegible] [illegible] Then they lay eggs in the disintegrating [illegible] [illegible] are very lively, and, if you approach the bait with a light, they are likely to scuttle out of sight before the capture can be accomplished.

In anticipation of this, we designed cans like old-fashioned flytraps, [illegible] screen cones. The bait was placed [illegible] the can; the beetles would enter the small aperture at the apex of the screen cone, and, when once in the can, would be unable to get out.

We baited several such traps with dead mice, placed them at various locations in the woods, and covered them half over with leaves and [illegible].

The method worked beautifully. Next morning, at the bottom of each can were a half-dozen or more black beetles, each about [illegible] inch long and with elytra (hard, shell-like wings common to all beetles) gaudily [illegible] striped with gleaming orange yellow [illegible] (page 250).

When I showed these specimens to my brother, who came to visit us that day, he took

A Parasitic Fly: Its Larvae Kill Giant Larvae

[illegible] Japanese [illegible] moth [illegible] wild strawberry [illegible] on the head or [illegible] is small and [illegible] and-

Uncle Sam's "Insect Iron Curtain" Stops Pests at the Borders

[illegible]

one look and exclaimed: "There ain't no such animal." During all the years he had roamed and [illegible] he had [illegible] seen [illegible].

This [illegible] one of the [illegible] and [illegible]. [illegible] of [illegible] insects, one [illegible] that [illegible] to casual observers [illegible].

There are probably more [illegible] insects on this planet than of all other [illegible]. [illegible] have been described, yet these [illegible] only [illegible] of those yet to be [illegible].

Among [illegible] have been catalogued in the museums, [illegible] entomologist can tell you that there are hundreds of thousands more, mostly in the tropics, unknown [illegible].

The [illegible] experiment. We [illegible] of [illegible] including indole and scatole, whose odors resemble those of decaying meat or [illegible]. We [illegible] with [illegible] again with a [illegible].

Next morning we found [illegible] in the mouse-baited trap but none in those baited with [illegible].

Our purpose was to catch bugs, not [illegible], so that [illegible] we [illegible] further use of the [illegible].

Of course it is true that [illegible] have made many [illegible] of [illegible] and have proved that [illegible] can be [illegible]. Indeed, [illegible] knowledge [illegible] we decided [illegible] and honey to attract the insects with a sweet tooth.

To convert the old [illegible] into a photographic studio, we pushed [illegible]

Flame Lightning Cleaves the Sky above a South African Game Field

[illegible]

[illegible]

High-speed Lights Freeze Motion

[illegible]

Finally, there was a powerful incandescent [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

(for monsters). The idea was to place an appropriate background of grass, leaves, or flowers in the box, then to add the live inserts and close the lid.

The lights were spotted on the transparent box, so that whenever an interesting pose seemed to be attained by the more or less free-roaming insects, I could press the camera's button and so freeze real-life action.

The first subjects were some soldier beetles. They were moving over and around the foliage in one of the medium-sized Lucite boxes, and I was about to proceed with the picture taking. Then I saw a layer of moisture creeping over the clear front of the box, blurring the scene. Foliage and beetles were "sweating," and the moisture was condensing on the Lucite.

I tried lifting the lid a bit; then reducing the amount of foliage; then decreasing the number of enclosed specimens. None of these expedients worked, so finally I did what I should have done in the first place: constructed the two side walls of the box out of wire screening to allow full ventilation. With this accomplished, we attained the result shown on page 257.

Iced Bees and Hot Lights

Bumblebees and wasps presented problems of a different sort. We weren't worried much about being stung (though that happened, too), but the creatures were so active in confinement that almost immediately the Lucite front would be dirtied by their crawlings and maneuverings.

The Nature photographer never likes to employ artificial restraints, but in this case it was necessary. We would either place the specimens, bottled, in an ice bucket for a time, or give them a whiff or two of ether.

Neither procedure killed or even stunned; it merely decelerated. While in this state, the insects slowly crawled up and over the posed flower or leaf cluster, and when they were in what we fancied was the right position, we snapped the shutter.

We found the ice-bucket method somewhat better than the ether, but it was not without its drawbacks. Warming an insect, of course, quickly negates the effect of a previous chilling. Needless to say, often while the intense focusing beam was on, our photographic subjects would spring to life and out of the area of focus. Then we had to begin all over again.

All the insects shown in the color series are alive except the Cecropia and Polyphemus moths on pages 254 and 255. The colors of these moths and the details of their scales and hair structure are so striking that I felt justified in using mounted specimens for these pictures, since no living ones were available.

Ladybirds, angelically harmless, were none the less exasperating. I would get a number of them sitting nicely on a flower and move it ready to take the picture, when, all of a sudden, and seemingly in unison, they would up and try to "fly away home" always, of course, a split second before the shutter snapped.

Grasshoppers, too, were unreliable, and in making the take-off leap they would invariably wreck the tiny stage setting I had prepared for them.

Most friendly and cooperative, and needing no box or artificial restrainers, were the praying mantises (page 244). I would place two or three of them on a branch, and for a matter of minutes they would pose, preen, and be quite indifferent to the camera's shenanigans.

In all, I found insect photography to be about on a par, as regards difficulty, with bird photography with which I have had considerably more experience.*

On one of our visits to the farm, we encountered a spell of rain, so we packed up the equipment and I took it home, together with as many live insects as we could catch that day and maneuver into cans, jars, test tubes, and even buckets.

When I arrived at my New York apartment thus burdened, my wife, for some reason, welcomed me only lackadaisically. But little Eda, showing true scientific spirit, was enthusiastic.

Her enthusiasm grew when I opened a package that had arrived in the mail that day from Florida, marked "Rush! Perishable!" It had been sent by Dr. David Fairchild, distinguished botanist and a Trustee of the National Geographic Society, who knew of my insect project. He himself, long ago, had discovered the fascination of insect photography and presented the memorable results in this Magazine.†

When the lid was removed, we found, nestled among greenery which Dr. Fairchild had placed in the box for moisture and food, a giant caterpillar with a face that looked like a lion's (page 258).

Sphinx with a Built-in Taillight

Even more remarkable, near the creature's hindquarters was a little structure that kept wiggling and flashing like the light on a fire-chief's car. The thing was actually a mirror-like membrane, about the size of a pinhead, [illegible] lights. Presently the flickering stopped, but

* See, in the NATIONAL GEOGRAPHIC MAGAZINE, "Fantastic Leaf Statues of Andros Island," May, 1951; "Search for the Scarlet Ibis in Venezuela," May, 1950, and "The Park Birds of Texas," November, 1949, all by Paul A. Zahl.

† See "Monsters of Our Back Yards," by David Fairchild, NATIONAL GEOGRAPHIC MAGAZINE, [illegible]

Lacewing Extends the Wings of a Pair of Big Spreads an Unpleasant Odor

[illegible] Lacewing.

Sulphur Butterfly Appears to Be All Wings and No Body

[illegible] Sulphur Butterfly [illegible] the blade rest there against the body.

Queen Butterfly Defends Her Fragile Beauty with Bad Taste

[illegible] Queen Butterfly. The [illegible] Bahamas.

Giant Moths Have Fuzzy Bodies and Broad, Wingspread

[illegible]

[illegible] **Cecropia** [illegible] one of the largest American moths. **Polyphemus** [illegible] or the [illegible] such as Luna [illegible] Danaus, [illegible] of the eyelike spots on its wings. These specimens [illegible] on a begonia plant show the wings in a position [illegible] in Nature.

[illegible] **Cecropia** [illegible] to make [illegible] wings [illegible] resemble leaves.

[illegible] Polyphemus [illegible] transparent, the [illegible] consists of [illegible] scales.

[illegible]

Beetles Do Good and Bad. Japanese Invaders at Lower Right Are Plant-eating Pests; Ladybirds and Scavengers, Beneficial

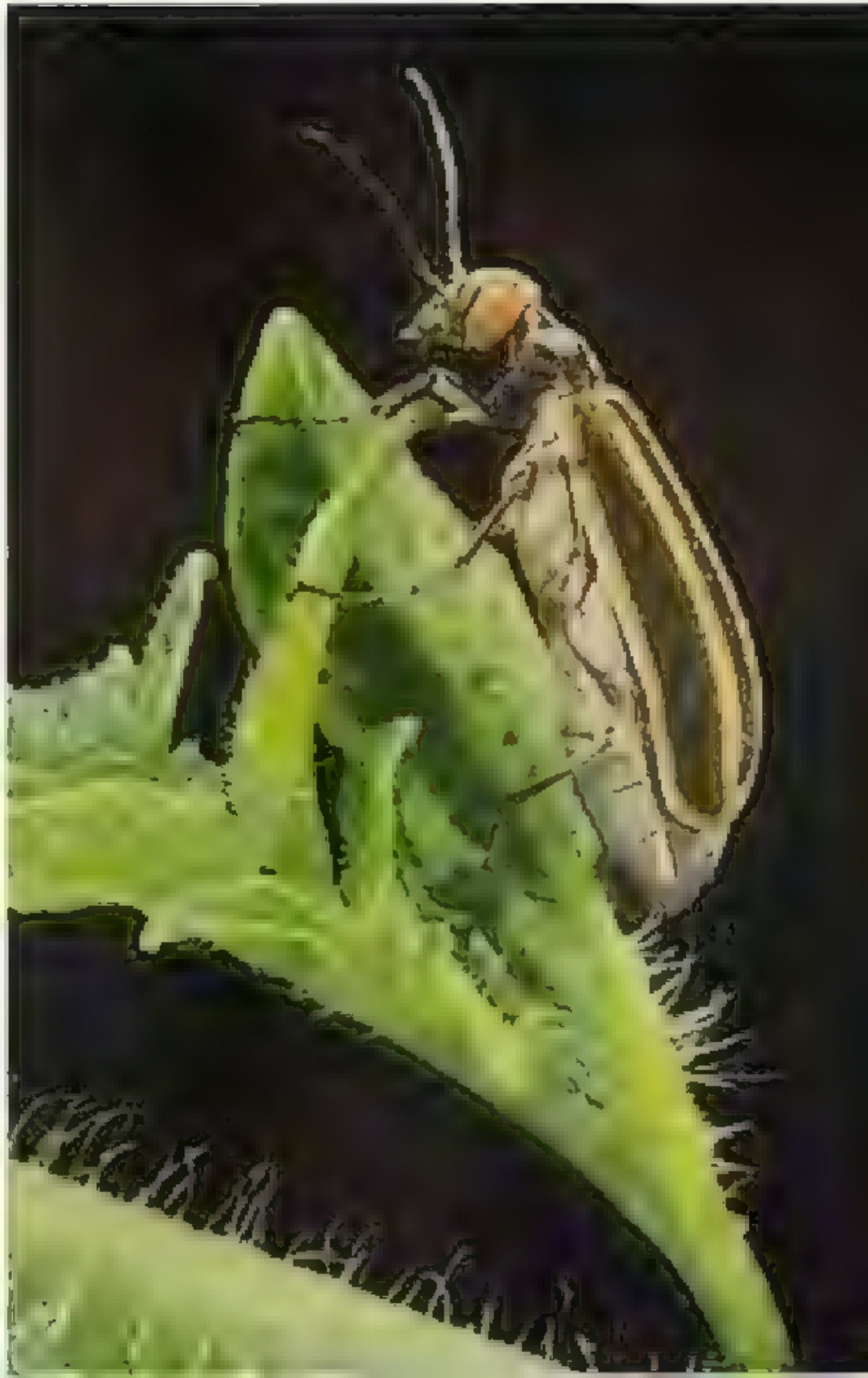
Ladybirds [illegible] **Scavenger Beetles** [illegible] **Japanese Beetles** [illegible]

Soldier Beetles Wage War on Many Harmful Insects

[illegible]

A Blister Beetle Can Raise Blisters

[illegible]



↑ A Black Widow's Bite Is Seldom Fatal, but the Pain Is Agonizing

← Fake Eyes Scare Foes of the Sphinx Moth Grub

Two Bug Beetles Look in Beetle Pictures, One Crawls Across His Enlarged Portrait

Parts of the broad-headed root borer (upper) are poplar, oak, and chestnut trees. The Colorado potato beetle (lower) did not begin to eat potatoes until the plant was introduced into the southern Rockies as home. They sit on a page from the *Field Book of Insects*, by Frank E. Lutz (G. P. Putnam's Sons)

each time my fingers came close, it would begin again.

The covering letter from Dr. Fairchild explained that it was the larva of a moth pupa in his tropical gardens at Coconut Grove, Florida. It was a larva of the sphinx moth (*Sphecodina abbotii*), and the glittering tail ornament, more or less typical of members of this species, is intended to frighten enemies.

One scientist has described seeing an oriole, about to devour one of these grubs, turn away with a scream when the creature lifted its ornamented tail with the tubercle shining like an eye.

Self-protection, the endless job of staying alive in a world full of hungry birds and animals, accounts for much of the brilliance and intricate design any color camera captures. In many cases, design and hue match the twig, leaf, or plant on which the insect lives; yet, in general, the longest-lived bug is the one that is hardest to see.

But even this rule has exceptions. The insect that is unpleasant to taste, or poisonous, or has a sting, may advertise itself in brilliant colors to warn potential enemies away. The [illegible] example (page 253).

More palatable bugs, in turn, may imitate their sour or stinging cousins to scare off predators. There are flies that look like bees and moths that look like wasps.

Nature Uses Varied "Paints"

Nature paints her insect coats in a variety of ways. Many of the lovely hues of some butterflies and moths are produced by the diffraction, or breaking up, of light by multitudes of microscopic ridges on the tiny scales covering the wings.

The gold color of the Cassida beetle comes from an extremely thin film of fluid under the skin, which also diffracts light.

The green of some caterpillars is created by chlorophyll of the plants they eat, deposited in the digestive tract and blood.

With my grub that looked like a lion, plus the rest of my captives, I had enough models to keep my camera busy until dawn.

Not all the insect pictures were made under the studio conditions of a barn or a city apartment. There was a big sentry thistle bush out in one of my brother's meadows which, during the warmth of midday, was always alive with bumblebees, honeybees, and wasps. And there was one particular blossom that seemed never to be without a nectar-hungry visitor.

I set my tripod up close and brought that blossom into camera focus. Here breeze was my enemy, for the thistle kept swaying to and fro, in and out of the frame. Finally I stuck a lath into the ground alongside the stem and tied the two together.

Now, with the bloom more or less immobile, I waited. First a gorgeous yellow and black bumblebee alighted and went into its feeding routine, completely indifferent to the lens only a foot away (page 245). When the bee left, a wasp arrived and also behaved like a trained model (page 242).

Lights Make Caterpillars Dash

One would ordinarily think that slow-moving caterpillars would be among the simplest of insects to photograph; yet they, including the tussock in the city, were among my most difficult subjects.

The principles of physiology were against me here, for whenever I turned my focusing light upon a group of caterpillars crawling over a set of pressed leaves, the animals would act like creatures in a speeded-up movie. Metabolically excited by the light's heat, they would scurry madly in all directions and be out of focus or out of the frame before the camera was half adjusted. Only by prefocusing on the background, adding the caterpillars, and then shooting blind, was I able to get these pictures.

The scavenger beetles were just as uncooperative. In the subdued illumination of the barn they would crawl around on whatever background I had provided. But the instant my focusing lamp went on, they would speedily hide behind anything that would shield them from the light. Here again the prefocusing technique was employed, not always with auspicious results.

During cool nights on the farm, Andy and I would retire to the little house in the woods, build a big fire in the fireplace, light a kerosene lantern, and read up on the insects we had collected and photographed during the day. I had taken entomology courses in college, including Prof. W. M. Wheeler's famous "bug" course at Harvard; yet some of the most elementary facts about insects now took on meanings that had escaped me years earlier in the classroom.

I learned anew that without these creatures at work pollinating, boring, scavenging, and supplying a food source for other animals, the balance of Nature would be seriously altered and the whole world greatly changed for the worse.

Probably less than one percent of all insects are harmful to our crops or health; most of those remaining are beneficial in some way or another to the combined well-being of plants, animals, and man. Entomologists take this fact into account before advocating too-widespread use of powerful new insecticides.

In one of our books was an amusing account of insects as a component of human diet. If I had said to Andy: "Let's have grasshoppers for breakfast tomorrow," he would have known I was joking. Yet Hottentots consider a locust pleasant as manna from heaven. Australian bushmen still eat various types of raw insect larvae or pupae. American Indians enjoyed roasted crickets, as well as the queens of leaf-cutting ants.

An ear of corn full of boters, Aztecs thought, tasted better than a clean one. Likewise there are people of Oceania who prefer their breadfruit well sprinkled with maggots.

But civilized man, who relishes crabs, oysters, snails, and frogs' legs, scorns insects as food. Perhaps some day our chefs will rediscover them.

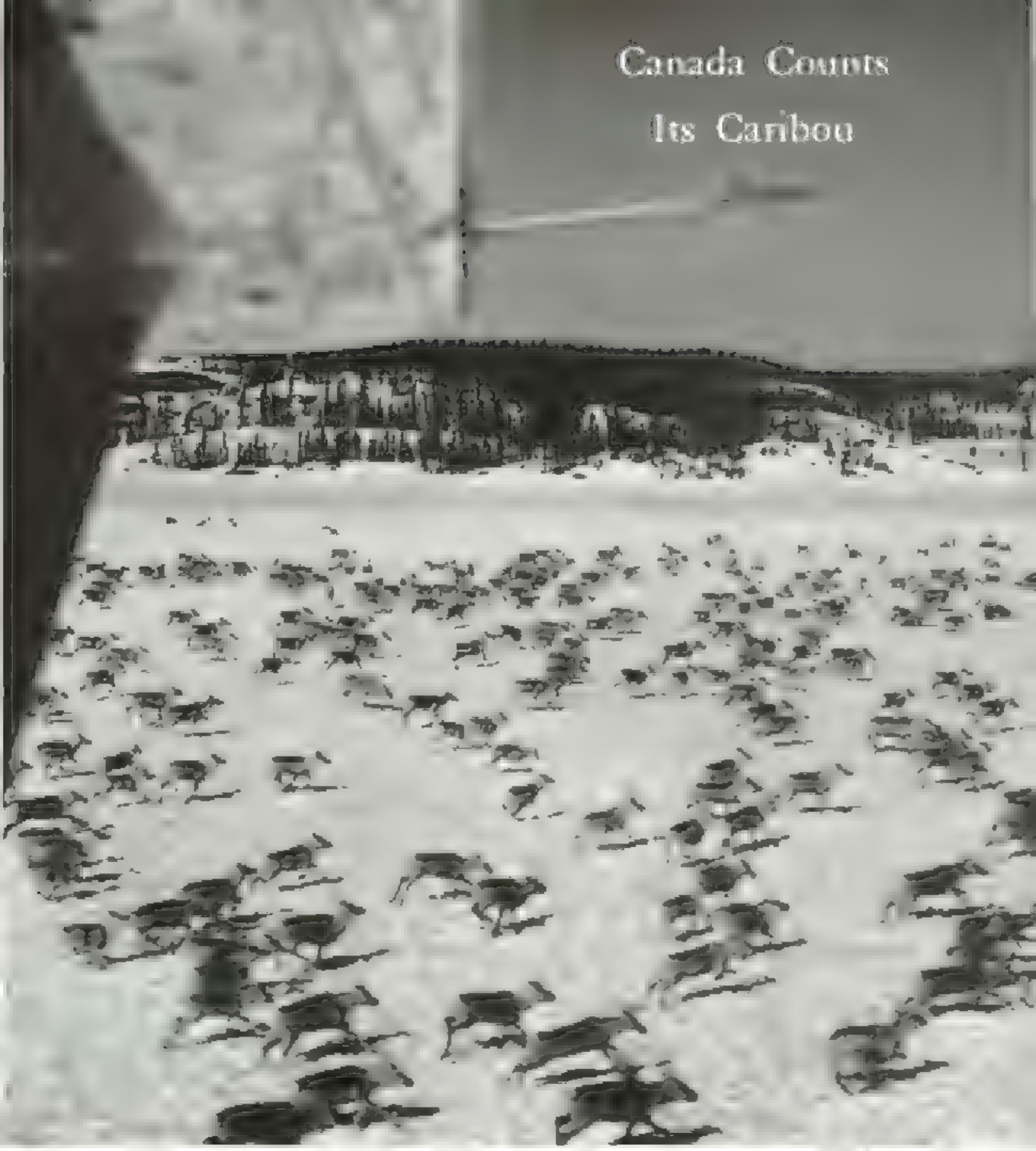
Autumn Lowers the Insect Curtain

Andy Nowak and I had started our New Jersey insect studies early in September, spending several days to a week at a time on the farm. We made our last visit late in October. Now the leaves had begun to take on their autumn colors, and the insects were noticeably fewer.

Some of them would migrate to escape the rigors of a northern winter, but the great majority, having served Nature's plan, were doomed to an early death. Among the former were the monarch butterflies, whose annual migration south represents one of entomology's great puzzles. As though by common directive, they are all off for warmer climes at almost precisely the same time, roosting in the trees en route in enormous numbers.

As winter took over the countryside, the leaves fell, the ground hardened, and our woods and fields looked barren and dead. But in fact, they were not. For hidden under fallen leaf and bare bough, in nuts which the squirrels had cached, in burrows, galls, seeds almost everywhere, lying quiet and unseen were insect eggs, larvae, or pupae waiting to be awakened six months later by the magical touch of spring.

Canada Counts Its Caribou



A Caribou Herd May Take Days to Pass a Given Point, Vanishing Fully This Scampering Pack

[illegible]

Domestic Reindeer Hold Aloft a Thicket of Velveted Antlers

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

◄ A Long Walk Across Harness a Herd of Caribou

Saturday Night In Gossip Lake on the Northern Ontario Waters

[illegible]

Indians, Eskimos, and Whites Kill 110,000 Caribou a Year

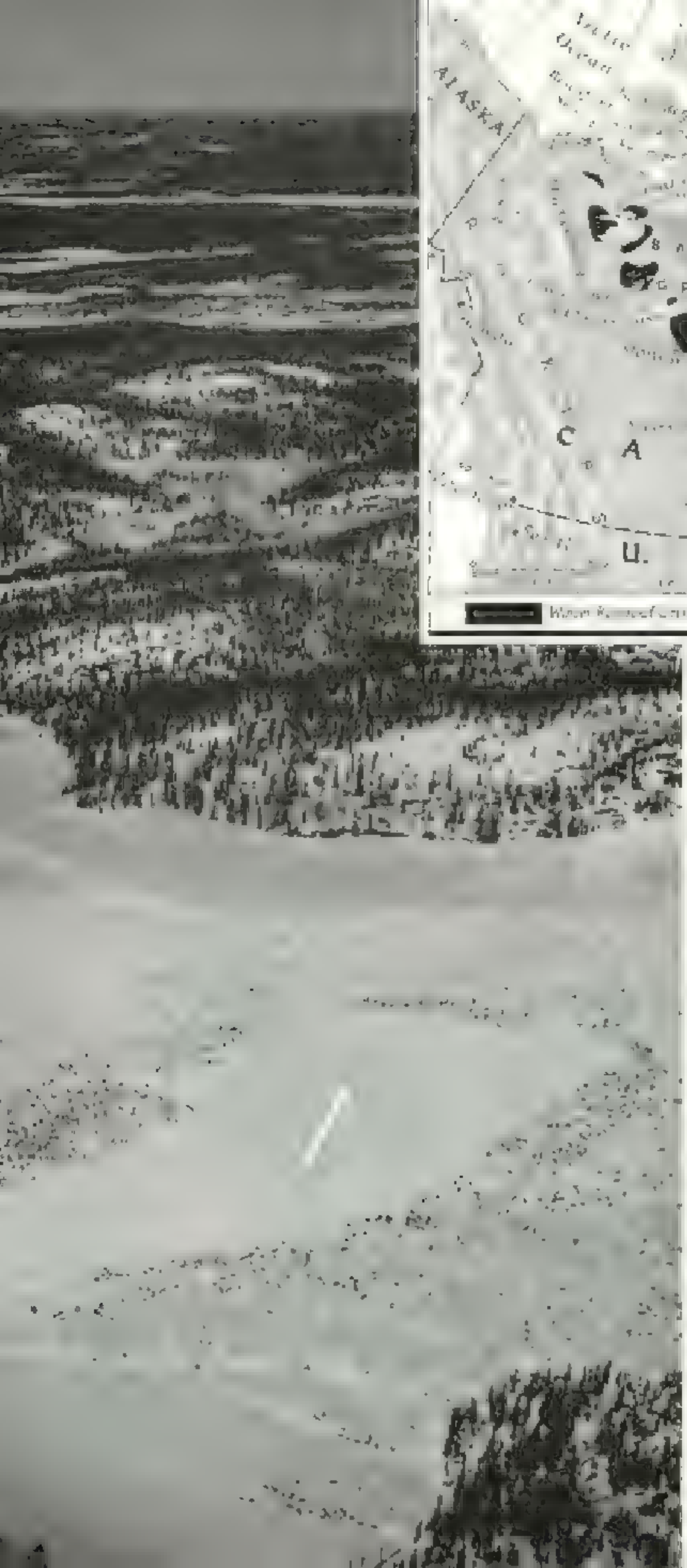
[illegible]

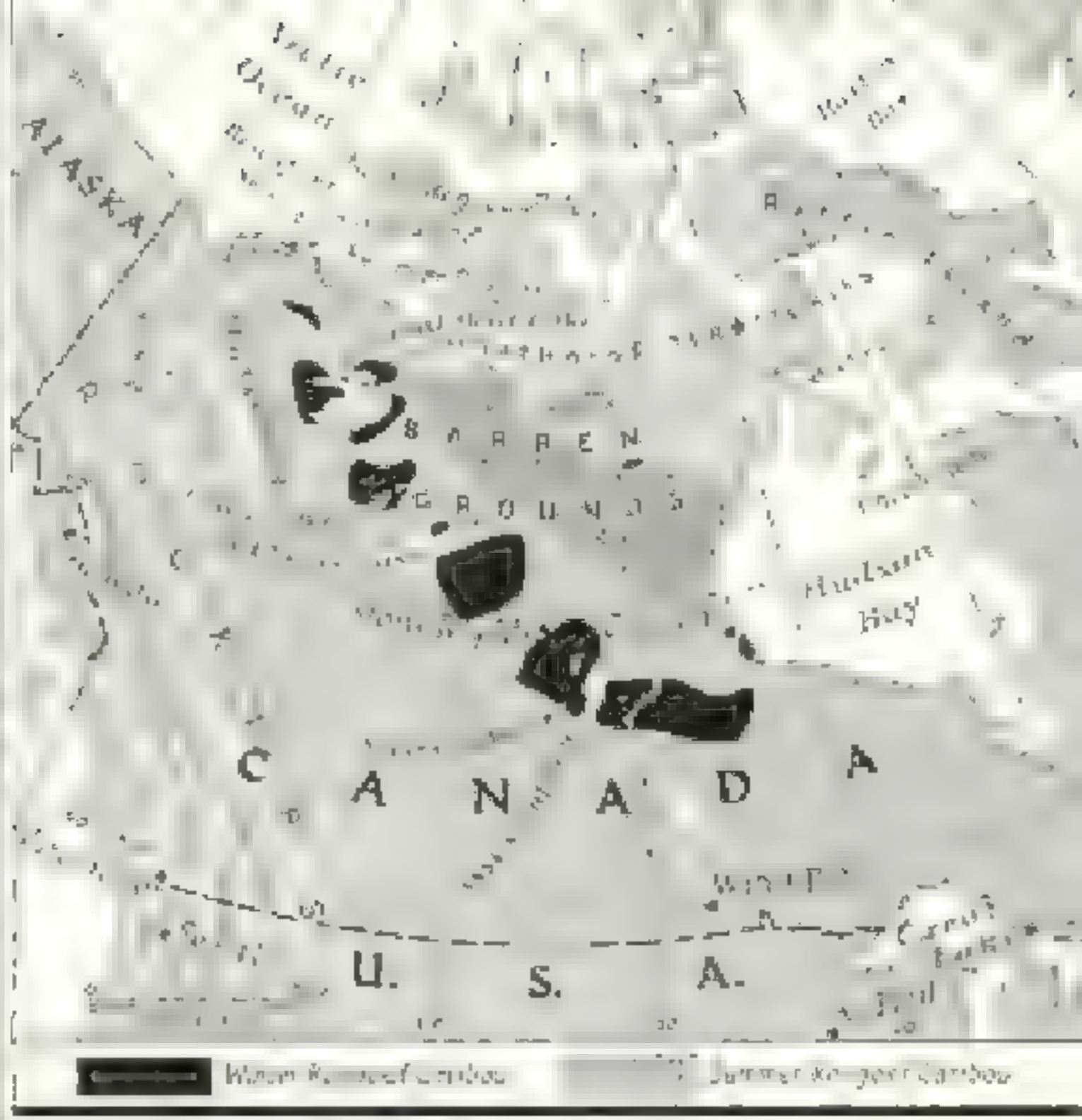
8 Looking on the Heads of the Herd, the Wolf Looks for Stragglers

[illegible]

9 Common Post Mortem in Most Cases: The Killer Was Man

[illegible]





Caribou on the March Give a Wolf (Arrow) a Wide, Hollow Berth

A Bear-dog gang takes Two Men, One to Hold, One to Chop

[illegible]

Y An Eskimo Huntsman Gives Pointers on the Way to "Shoot" a Bear

[illegible]

Water for the World's Growing Needs

Even Seeking More, Man Makes Better Use of Earth's Liquid Assets, Fights River Pollution, Even Desalts the Sea

By Herbert S. Nichols and F. Barrows Colton

WHEN drought hangs hot over the land, when fields parch and wells run dry, men in many parts of the world, in their seasons, look to the sky and pray for water—*mayo, shui, pani* in Arabic, Chinese, Hindostani.

Yet within the same year runaway rivers like the Mississippi and Yangtze spread ruin, death, and destruction over hundreds of square miles.

How to make best use of the rain that falls is one of man's oldest and greatest problems, for without the bounty of the clouds life on earth would not last long. Our very bodies are about two-thirds to seven-tenths water. A man can live some 30 days without food, but no more than a week without water.

Americans Use 1,100 Gallons a Day

New York City authorities watch daily rainfall reports with new interest since their wryly remembered water shortage of 1949–50. Actually, they suffered only minor inconveniences—fewer baths and shaves, no washing cars and sprinkling lawns, using paper cups at fountains instead of drinking from spouts, and washing all the day's dishes at once.

But these small annoyances drove home a telling fact: even in a great modern city you can't take water for granted.

Nowadays we hear much about dropping water tables, artificial rain making, the urgent need of finding a way to make the ocean drinkable. Yet actually, for the earth as a whole, we have as much water as we ever had. Though rainfall varies from year to year, there is no sign of any permanent decrease.

Rainfall in the United States has averaged 30 inches a year ever since 1870 when Government agencies started keeping records. Every year, as rain, snow, or hail, 10 million gallons fall for every man, woman, and child in the country—surely enough to go around. Then why these water shortages?

One difficulty is that the water is not evenly distributed. In many local areas the demand is exceeding the present supply. Sites for our industrial and population centers were not often chosen with an eye to long-range water needs.

But another important part of the answer is the fact that world population is growing—now placed at about 2,400,000,000—and that many millions are using more water than ever.

The average American uses far more water than his grandfather. Bathtubs, sinks, and running water are considered essentials rather than luxuries. Electric washing machines, automatic dishwashers, garbage disposal units, all require more than the old-fashioned equipment they replace. In Washington, D. C., air-conditioning plants are estimated to account for 15 to 20 percent of the water now used.

Though our average citizen drinks less than half a gallon of liquid a day, he uses about 1,100 gallons of water daily for all domestic, agricultural, and industrial purposes, not counting hydro power. In just the last ten years use of water in the United States has jumped from 150 billion gallons a day to more than 170 billion.

In Texas the population nearly tripled in the 50-year period ending in 1940, but use of water increased 71 times on an average for all purposes. For industries and municipalities the increase was 30 times; for irrigation, about 55 times; for water power, about 85 times.

Vast Quantities Needed by Industry

Few people realize that today water is the largest single raw material used by American factories. We could not make cars or television sets without plenty of water.

For example, it takes 65,000 gallons, or 270 tons, of water to produce one ton of highly finished steel. Chiefly for cooling and quenching and granulating slag, American iron and steel mills use nearly five times as much water in an average day as all of New York City.

To make a ton of the high-grade paper used in this Magazine takes 70,000 gallons, to wash away impurities and assist the refining process.

Other industries use vast amounts for cooling, removing impurities, preparing solutions, and diluting and removing wastes, besides using water as an ingredient of finished products.

Many industries, including steel plants, oil refineries, and chemical factories, circulate used water through cooling towers and re-use the same water as often as ten times.

In the last 100 years, population of the United States has increased more than 600 percent—which means six times as many users for the same amount of water.

Most of this great growth of population has been in the large cities. Half of the people of the United States now live on less than two percent of its land area.

This puts a heavy strain on local water supplies, and many cities have to reach farther and farther out to find enough water to fill their needs. New York City, for example, is tapping the Delaware.*

Some cities have grown faster than their water systems could be expanded. Population also has mushroomed in some arid areas where water supplies are limited. In California two-thirds of the available water is in the northern half of the State, two-thirds of the population in the southern half.

Drips That Drain Reservoirs

Even where water is scarce, much is wasted. During New York's water shortage, engineers estimated that 200 million gallons a day were being lost from leaky faucets and pipes alone.

Ground water is wasted in large parts of the West by phreatophytes, plants that often send thirsty roots far down into the subsoil. Most of them are of low value—mesquite, salt cedar, cottonwood, willow; a useful one is alfalfa. The water they draw from the ground is eventually dissipated into the air.

The U. S. Geological Survey estimates that phreatophytes in Nevada waste five times as much ground water as is consumed for useful purposes. In 17 western States approximately 15 million acres of such plants are believed to consume enough water every year to cover 20 to 25 million acres one foot deep.

Floods in which vast amounts of water run off without sinking into the ground or being held by reservoirs, represent a resource whose only present contribution is to keep stream channels scoured out—a purpose that could be achieved by smaller, less wasteful flows.

Nothing Lives Without Water

Until it gets scarce, man gives little thought to the water he uses. Yet in many ways it is a strange liquid, unlike anything else on earth.

What is water? Everybody knows the famous chemical formula, H_2O, which means that one molecule of water contains two atoms of hydrogen (H) and one of oxygen (O). If you studied chemistry in high school you [illegible] hydrogen in the presence of oxygen to make them combine.

Water covers nearly three-fourths of the earth's surface, and most of it is too salty to drink. But the oceans provide the gigantic reservoir from which water constantly evaporates to fall back upon the earth. Without water our planet would be a dead and desert world like the moon.

The human body needs more than a quart a day to replenish normal losses. Every day an average adult loses about a pint and a half of water by "insensible perspiration" through the skin and in exhaled air, in addition to that given off by the kidneys. Tests made by the U. S. Army show that a man working hard in the desert under average heat conditions loses water at the rate of nearly two quarts an hour.

Of the water that composes about 60 to 70 percent of a normal human body, most is lodged in the billions of tiny cells that make up living tissue. Thirst becomes critical when the body has lost too much water without taking in a balancing amount.

Proportion of liquid to solid varies in different parts of the body. Saliva is almost 99.5 percent water, but tooth enamel has only 2 percent. Bones are about 22 percent water, muscles 75, and blood serum 92.

We take in water not only when we drink fluids but when we eat. Some physicians believe that many people in the United States do not consume enough water to maintain the best possible health.

Some plants and animals, like the cactus or the camel, have special mechanisms by which they can store water whenever it is available or get along on a minimum when it is not.

Our Water as Old as Earth

Water is ageless and almost indestructible. It is one of the few things in Nature that can be used over and over again. We are drinking and using the same water now that existed when the earth was born.

This water is just as good today as it was three billion years ago. Though it may be polluted by wastes poured into streams, or made undrinkable by ocean salt, it becomes clean and fresh again as soon as it evaporates into the atmosphere.

Even rain water, however, is not completely pure chemically. It picks up many things, including traces of ammonium salts and gases from the air, and, when it falls near towns, a little sulphuric acid given off by burning coal. Absolutely pure water is unknown in Nature; even in the laboratory it is difficult indeed to get all foreign chemicals out of a water sample.

Minor impurities affect the quality of water. Rain water is "soft"; that is, it contains little or no calcium and magnesium. "Hard" water contains more of these salts and ranges from moderately hard to very hard depending on the amounts present.

When used in washing, hard waters require much more soap than softer waters because part of the soap is consumed by these salts. The resulting "curd" is largely responsible for the well-known ring around the bathtub.

Water can be softened by boiling, by treat-

* See "Today on the Delaware, Penn's Glorious River," by Albert W. Atwood, NATIONAL GEOGRAPHIC MAGAZINE, July 1957.

A Cloud-seeding Plane above the Catskills Hunts Rain for New York Reservoirs

[illegible]

[illegible] with chemicals that precipitate out the [illegible], or by sand filtering.

Through million [illegible] water supply has [illegible] the earth. [illegible] surface water [illegible] if by-passed [illegible] direct [illegible] the [illegible].

[illegible] of [illegible] cubic miles of water a year—[illegible] million billion gallons. [illegible] water is [illegible] the [illegible] and much of the rest is frozen [illegible] and Antarctica [illegible] the growing process.

Where Our Water Originated

[illegible] hold that when the earth was [illegible] a great deal more water in the atmosphere than now, and that this fell as rain to fill the oceans [illegible] water was locked up in the rocks of the crust.

[illegible] all the water was carried from within by way of hot springs.

Wherever it came from, we had it all. Of this huge supply, [illegible] water is in the oceans and much of the rest is frozen in the great icecaps of Greenland and Antarctica [illegible] way or [illegible] the [illegible].

"Little Drops of Water . . ."

[illegible]

[illegible] in Alaska, northern Canada and Asia where the [illegible] places [illegible]

[illegible] moisture in the air [illegible] Air containing [illegible] would be [illegible] to breathe [illegible] would [illegible]

Clouds form when moisture in the air condenses into tiny droplets of water or [illegible]. The droplets form around [illegible] or water-attracting particles of [illegible] always present in the air.

At first the droplets or ice crystals are tiny [illegible] When [illegible] about two-tenths of a millimeter in diameter [illegible]

Raindrops and snowflakes often grow as they fall [illegible] lose their teardrop shape [illegible]

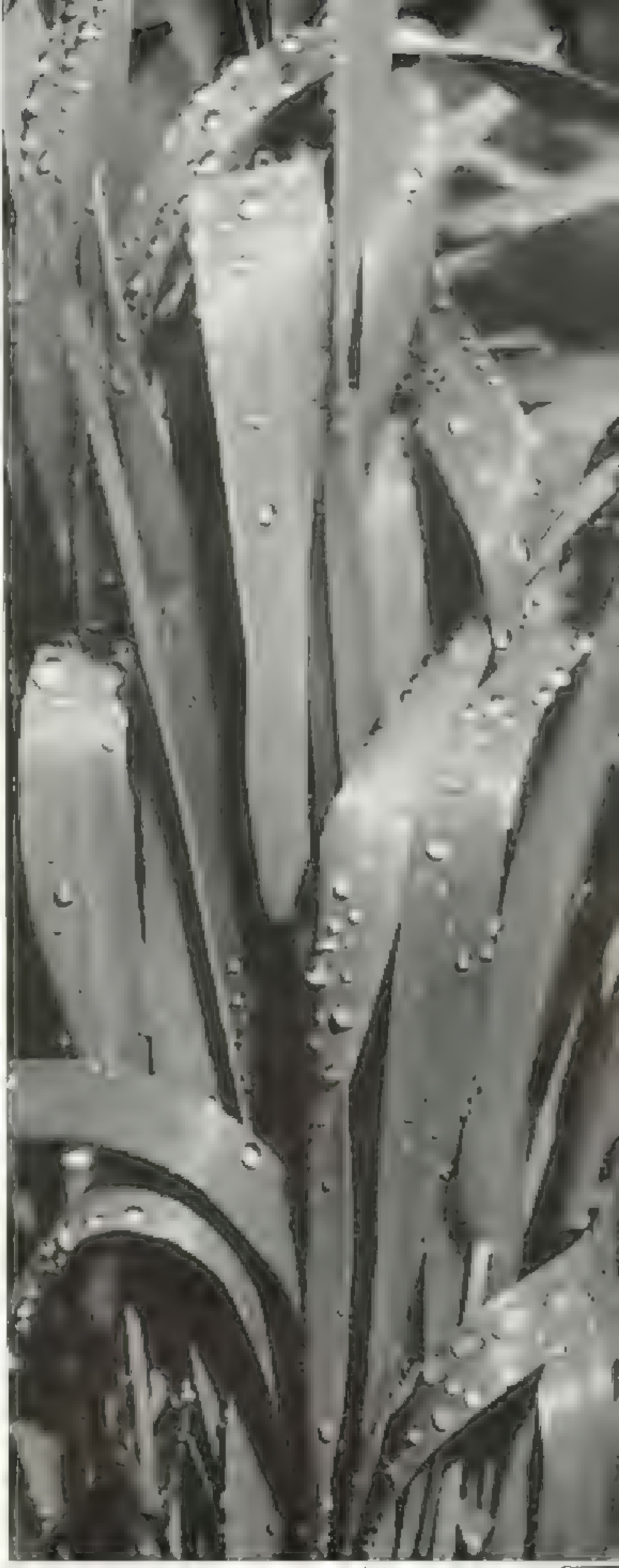
The wettest place in the world is Mount Waialeale [illegible] Hawaii [illegible] Assam, in the [illegible] and [illegible] Colombia.

In contrast, the place with the [illegible] rainfall [illegible] Chile [illegible]

[illegible]

Living Plants Prevent Erosion

[illegible]



Southern China's Bamboo "Ferris Wheels" Raise Water to Thirsty Rice Fields

[illegible]

Asia's [illegible] forms part of the largest [illegible] region in the world, a vast [illegible] that extends across Africa and southwest Asia, from Turkestan and Mongolia [illegible] the Pacific shores of Asia (p. 251).

Irrigation Turns Deserts Green

Nearly a third of the earth's land surface receives 10 inches of precipitation or less annually. For another third the usual amount is only [illegible] inches. In places that get less than [illegible] inches, and on most of the area receiving up to 20 inches, irrigation is required for raising crops.

For maximum yield, even areas having 40 inches or more annually may need the magic touch of water sluiced through ditches if there are long dry periods during the growing season or if the climate is hot.

In the United States [illegible] line, which divides the [illegible] arid in half. There is generally [illegible] rainfall. Precipitation increases from 22 inches a year on the Great Plains to [illegible] Gulf coast.

West of the [illegible] line is where America's water troubles begin. Except in the rain-rich Pacific Northwest much of the West is arid unless irrigated. Large parts of Utah and southern California would support only a sparse population if it were not for irrigation. Nearly 23 million acres are irrigated in the 17 western States.

Why do places like Washington's Olympic Peninsula get so much rain while our Great Plains get comparatively little?

Washington, Oregon, and northern California are visited by prevailing westerlies heavy with moisture from the Pacific Ocean. When these wet winds reach the mountains

* See map, "The United States of America," a supplement to the June 1951 NATIONAL GEOGRAPHIC MAGAZINE.

[illegible]

[illegible]

Winds Converge to Make Rain

[illegible]

You Can Brew a Snowstorm in a Home Freezer

[illegible]

[illegible]

In Southern California, rainfall is light. In northwestern Brazil, [illegible] A few [illegible] Mexico and the southwestern United States.

Drawing on Underground Deposits

The largest reservoir of water in the United States is underground. Water percolates downward through the soil and into the pores and crevices of rocks. In time, it reaches the depth where the rock is completely packed by the pressure of the water above and cannot further drain. This solid rock holds more water than all the surface lakes and ponds put together. This ground water is what feeds wells and springs.

We don't know just how much ground water we have, but only a small part of the United States has been explored, especially to determine the [illegible] under the surface. Nevertheless, [illegible] of the country.

We do know that in some areas we are actually mining ground water faster than Nature is replenishing it. In several parts of the country, pumping from wells in some places is actually removing water that has taken [illegible] years to accumulate.

In some regions where water once flowed freely from artesian wells it now has to be pumped. The U. S. Geological Survey reports that the ground water level has dropped [illegible] feet in some [illegible] of Texas.

Under vast areas of the earth, this "water table" varies in depth. It is generally nearer

A Beaver Fish Catches Missouri River Flood Water at Omaha, Nebraska

[illegible]

[illegible] the surface in various [illegible] A [illegible] ground water in [illegible] and [illegible] of [illegible] hundred feet. [illegible] where [illegible] Gulf coast and [illegible] areas in the Great Plains where [illegible] to depths of more than [illegible] feet.

Ground water is what actually keeps most of our electric [illegible] running [illegible] potable. Without [illegible] water [illegible] would be no [illegible] to [illegible] and [illegible] from [illegible] or [illegible] [illegible]

Empty Wells Mean Empty Factories

[illegible] a problem in [illegible] energy [illegible] controls on water [illegible] Engineers [illegible] gallons of [illegible] rather [illegible] and [illegible] become [illegible] [illegible] tons, or [illegible] to great volumes of surface water [illegible] percent [illegible] of [illegible] gallons [illegible] Wood Water [illegible] and [illegible] stations [illegible] samples [illegible] and [illegible] expensive [illegible] In [illegible] Area [illegible] were [illegible] to [illegible] [illegible] Wise [illegible] North.

[illegible] Omaha [illegible] water [illegible] Omaha [illegible] is [illegible] for [illegible] purposes [illegible] [illegible] to [illegible] ground water during World War II [illegible] ground water was being pumped [illegible] than Nature could replace it and that some of the wells would [illegible] [illegible] ground water was of [illegible] [illegible] the wells were [illegible] [illegible] water was [illegible] [illegible]

Turbid River Water in a Few Minutes Dumped This Muddy Mess into a St. Louis Basin

Two Million Gallons Rush Through This Pipe Each Minute

[illegible]

[illegible] been pumped out in summer for factory use.

A later survey revealed [illegible] water available from wells [illegible] and [illegible] to [illegible] factories [illegible] have [illegible]

Guarding Sources of Ground Water

At some points along the [illegible], fresh ground water has been [illegible] that salt water has begun to contaminate wells [illegible] for drinking [illegible]. Many [illegible] have been [illegible] the canals [illegible] were admitting salt water and be drilling new wells farther inland.

On Long Island, salt water salt water began seeping into the ground under Brooklyn [illegible] plants were found requiring fresh water, [illegible] other [illegible] well to obtain water for [illegible] purposes [illegible] to return the used water to the ground.

Conservation of ground water is [illegible] in [illegible] States in Spring New Jersey. [illegible] Wisconsin [illegible] States regulate [illegible] some [illegible] other States have [illegible] for [illegible].

Sources where ground water [illegible] for [illegible] supply [illegible] water for irrigation of American farms. The U. S. Geological Survey has [illegible] of which have [illegible] supplies [illegible] more [illegible] people [illegible] other [illegible] supply [illegible] of [illegible] springs [illegible] the present [illegible] large [illegible].

The [illegible] development [illegible] of [illegible] water [illegible] water [illegible] contamination [illegible]

channels. Most of our large springs are in northern Florida, the Missouri Ozarks, central Texas, the Snake River Plain of Idaho, western Oregon, northern California, and central Montana.

Hot springs are formed by ground water that has come in contact with hot subterranean rocks. Geysers erupting periodically, like Old Faithful in Yellowstone National Park, spring from ground water collecting in underground chambers until it grows so hot that steam pressure sets it up high into the air.

Ground water is preferred for many purposes, because it is generally pure and free from sediment and comes out at a uniform temperature, an important factor in industrial use. Water from underground is used for drinking by about half the people in the United States.

Taking too much water out of the ground may cause more than just a waterless city. Mexico City is built on top of a subterranean reservoir; as wells draw out more and more water, the entire city is slowly sinking.

There are similar spots in the United States where the land has sunk as much as a dozen feet.

Does "Seeding" Make Rain?

Many a farmer and rancher, in fields and pastures parched by drought, looks anxiously skyward with some trepidation as fleecy white clouds spread overhead but never rain.

Today most experts agree that it is possible, under the right conditions, to help Nature make rain. Some scientists, however, say they have never observed any rain or snow as "seeding" them either with dry-ice particles scattered from airplanes or with silver iodide smoke generated

* See "Water Resources Supply," National Geographic Society's Educational Motion Picture, December, 1951.

Armageddon of Biblical Fame Drew Water from This Spring

Women living near the Old Testament's famous battleground [illegible] up and down the winding stairway at extreme right to [illegible] daily ration. Here men working for the Oriental Institute form [illegible] brigade to excavate the ruins. This ancient engineering work proved to be the largest of its kind in Palestine.

Hawaiian Island of Kauai Claims Earth's Wettest Spot

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

▼ Shifting Sand Dunes Swallow an Oasis

[illegible]

Korea: A GI Measures the Chlorine In a Purifier

[illegible]

on the ground and carried aloft by air currents.

Pioneers in this field were Drs. Irving Langmuir, Vincent J. Schaefer, and Bernard J. Vonnegut, of the General Electric Company (page 275). They are credited with having started the first artificial snowstorm in this country by air-dropping dry ice on clouds over Mount Greylock, Massachusetts, in 1946.

Dry ice, the rain makers say, cools cloud water droplets enough so that they turn into crystals that turn into rain. Silver iodide particles provide tiny nuclei around which water droplets in a cloud are believed to condense into raindrops or snowflakes.

Other scientists, including U. S. Weather Bureau experts, believe [illegible] in many cases where rain has fallen from seeded clouds it would have fallen [illegible] anyway. [illegible] processes from those [illegible] here for [illegible] but much more research needs to be done before artificial rain making can be performed on a large enough scale or under sufficient control to make it really useful.

In arid parts of the West, water for irrigation — and others are already paying millions of dollars for cloud seeding. Some customers have been disappointed, but others are satisfied that seeding has boosted their rain and their crops.

Rain making is loaded with legal problems. Who owns the cloud? If farmers seed clouds and produce rain, rent by baseball teams and resorts may lose customers.

During its drought, New York City hired a meteorologist from Harvard University to try to increase rainfall and replenish its nearly empty reservoirs. Much rain fell, but the scientist [illegible] claimed credit for only part of [illegible].

Last year New York was faced with some $2,000,000 in [illegible] from other communities and individual citizens, alleging the rain making had damaged their interests. In its defense the city claimed that the program had failed.

Most large American cities still find that their surest sources of water are surface streams or lakes, even though they often must build aqueducts many miles long to reach them. One of ancient Rome's longest aqueducts, 58.4 miles, was the Marcia, built in 145 B.C. [illegible] downward. In [illegible] the city of Los Angeles [illegible] 39 years ago to tap the Owens River [illegible] water from the high Sierra Nevada. But soon the population of the city and its metropolitan area had skyrocketed to such size that more water had to be brought from Parker Dam on the Colorado River through 242 miles of aqueduct, including 92 miles of tunnels.

The old Roman aqueducts depended entirely on downhill flow of water, but in the Los Angeles aqueduct water is raised 1,617 feet by five pumping stations.

An even longer aqueduct, 430 miles, was built in 1903 to bring water to the Coolgardie and Kalgoorlie gold mining fields in Western Australia.

New York City has already outgrown the water supply it receives through aqueducts reaching 100 miles into the Catskills and is developing new sources in the same area.

Boston constructed the largest lake in Massachusetts for its modern water supply, which comes to the city from 65 miles away and passes through a tunnel 13 feet in diameter.

San Francisco draws upon the Hetch Hetchy reservoir, 160 miles away [illegible] the west

ward through the Coast Ranges by means of 52 miles of tunnel.

One of the great water-supply feats of all time is the U. S. Bureau of Reclamation's Central Valley Project of California. This transfers water from one river to the bed of another and eventually makes water available through exchange over an area 500 miles long to benefit sections where it is badly needed in the southern part of the State (page 278).*

Communities bordering the Great Lakes, such as Chicago, Cleveland, and Duluth, need only reach out far enough from shore to draw in lake water from beyond the range of city pollution, though that is farther today than formerly.

Conserving Our Liquid Assets

Today the United States is trying to control more carefully the water it has, so that as little as possible will be wasted and there will be enough for all. Recognizing this need, the President's Water Resources Policy Commission has made a Nation-wide survey, with recommendations for getting all possible use out of every raindrop from the time it falls on forest, farm, or city street until it evaporates or returns to the sea.

Strong emphasis, the Commission said, should be placed on multiple-purpose water projects with united programs to control floods, store water for drinking and irrigation, and generate hydroelectric power. When we try to manage water, we should do it for a whole river basin, including in a single plan flood control, water supplies, power, navigation, irrigation, drainage, recreation, soil conservation, and pollution control.

More than ever before, this country is making progress toward doing away with water pollution, caused both by sewage and by factory wastes. Fish are coming back and people again can safely bathe in many streams that once were little better than open sewers.

Much remains to be done. Water from many streams and lakes is still unfit for human use unless carefully filtered and chlorinated.

Cleansing Streams Pays Dividends

Polluted water kills not only fish but also the aquatic plants that provide food for waterfowl. Pollution once reduced the annual value of the salmon catch in the Willamette River, Oregon, from $5 million to $1 million, but new sewage-treatment plants will remedy the situation.

In 1900, for every 100,000 Americans, 30 to 40 persons died of typhoid fever, a disease spread by polluted water. Today typhoid is a rarity in this country, partly because practically all large cities now have sewer systems, partly because drinking water almost everywhere is treated to make it safe.

Originally most sewer systems emptied waste products directly into streams, harbors, or lakes, making the water unsanitary for drinking or bathing. Oyster-harvesting grounds in Hampton Roads, Virginia, were closed in 1926 because of pollution from surrounding cities. Today, since the building of four sewage-treatment plants the water is so much cleaner that 7,240 acres of the condemned area have been reopened.

Many factory wastes, also formerly dumped into streams, now are turned into useful products and sold at a profit. A chemical company found that its waste had a high vitamin content. Processed into vitamins, it is now the firm's leading product.

A steel company built a treatment plant to recover ore from blast-furnace flue dust once discharged into a near by river. It made a profit of $581,000 in the first year of operation. Another steel mill's "pickle liquor," a sulphuric acid by-product, once poured into a nearby stream, now is given to a local firm that uses it to make iron sponge for gas purifiers.

Chemicals "Wash" Drinking Water

Water that could cause sickness if drunk in the raw state often can be made safe with the aid of chemicals and filters. Treatment is done on an assembly-line basis by many cities and towns by filtering the water through sand and gravel, and by aeration. Copper sulphate, alum, chlorine, and sulphur dioxide are added as required to kill bacteria and remove taste and odor (page 277).

Not a single death from cholera and typhoid, both water-borne diseases, has been recorded among American armed forces in the Korean war, partly because all were inoculated against them, but also because troops are trained to consume only purified water and avoid eating native raw vegetables and fruits (opposite page, page 280).

In World War II American troops were issued Halazone tablets containing chlorine, which purified water when dissolved in it. They helped to hold down the rate of sickness from water-borne diseases.

Today these tablets are being replaced by a new type containing iodine, which is more effective against some forms of dysentery. They also give water a less unpleasant taste, which sometimes made soldiers reluctant to use the chlorine tablets.

How to keep our rivers from being muddied and clogged by sediment washed down from upstream slopes and farmlands is another

* See "More Water for California's Great Central Valley," by Frederick Simpich, NATIONAL GEOGRAPHIC MAGAZINE, November, 1949.

Black Blizzard: Dust Bowl Scourge of the 1930s

[illegible]

problem now being tackled on a Nation-wide scale. Some streams, as the saying goes, still are "too thick to drink, too thin to plow" (pages 276, 277).

When great dams are built to store water for flood control, irrigation, and power, sediment too often flows in with the water and gradually fills the reservoirs. Behind Hoover Dam, in Lake Mead, from which southern California draws much of its water, sediment is accumulating at an estimated 100,000 acre-feet a year. If this sedimentation continues at the present rate, authorities say, the lake may disappear in some 430 years, with only "run of the river" water available for power and water supply as less silting is restored.

Silt Filling Many Reservoirs

Many smaller reservoirs have already been silted out of use and abandoned. Studies by the U. S. Soil Conservation Service indicate that at least a fifth of the 3,000 municipal and industrial water-storage reservoirs now in use in the United States will have to be replaced or supplemented because of siltage in the next 50 years.

Much of this silt is washed from land used for crops or grazing, where the soil is not sufficiently protected against erosion. But erosion is being attacked on a large part of the Nation's farm and pasture land, where terracing, contour planting, crop rotation, and better management of grazing and timber are practiced under guidance of the U. S. Soil Conservation Service, Forest Service, and the Department of the Interior. More farmers and ranchers are adopting these practices every year.

If sea water could be made fresh cheaply, all the water worries of our great coastal cities would be over. Already we know how to do it, but so far the cost is too high to make it practicable on a large scale.

Science Desalts the Sea

Untreated sea water is unfit to drink because it contains a higher percentage of salt than the human body can handle. Actually, water is drawn from the tissues, and the body becomes dehydrated. Therefore, drinking sea water soon adds to thirst instead of relieving it.

A lifesaver for thousands of sailors and airmen cast away in boats or life rafts in World War II was a chemical unit for making sea water drinkable in small quantities. Salt water is scooped into a plastic bag, and a small chemical briquette is dropped into it, which in a few minutes removes the salts. Drinkable water made this way costs about $10 a quart.

One practical way to turn salt water into fresh is to distill or evaporate it, the same process Nature uses when water is drawn from the sea up into the clouds.

Stills developed just before World War II provided temporary drinking water from the sea for more than a million troops in the South Pacific and North Africa until local supplies could be developed.

Brackish water from wells in Saudi Arabia is distilled to make it potable and safe for oil workers. Many ships distill sea water for drinking.

Some new stills work on the principle of vapor compression. Steam is compressed mechanically, a process which raises its temperature and also causes it to condense into water at a higher temperature. Heat given off as the steam condenses is used to evaporate more water in the still.

Once started, this process is continuous, and the only power needed is for running the steam compressor.

Three stills that can produce 50,000 gallons each per day from the sea are in use on Johnston Island, in the Pacific, where other sources of water are slim.

Frozen Reservoir—the North Pole

Freezing is another way to make sea water drinkable. Polar explorers well know that sea ice melts down into fresh water. When water freezes, the molecules get together in a solid crystalline arrangement. But the molecules of impurities have no tendency to adhere to the growing ice crystals, and become concentrated in the remaining sea water.

Scientists have recently developed a small-scale model of another device for desalting sea water. In their machine, briny or brackish water is passed over special plastic membranes and the impurities removed by application of small amounts of electric power. Water emerges from the machine in two streams—about two-thirds in one stream as fresh water, the other third containing the salts and [illegible]

Inventors of the device estimate that, where electric power is cheap, salt water could be purified at a comparatively low cost; moderately brackish water, available in quantity in parts of the West, could be treated even more cheaply.

A noted chemist has predicted that before the end of this century some source of inexpensive energy, perhaps power created by harnessing the sun's heat, will become available so that fresh water can be produced from the sea at reasonable cost.

By such research, both here and abroad man is making a long-range attack on his age-old problems of water, that liquid asset without which none of us could survive more than a week.

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Articles and photographs are desired. For material The Magazine uses, generous remuneration is made.

In addition to the editorial and photographic surveys constantly being made, The Society has sponsored more than [illegible] scientific expeditions, some of which required years of field work to achieve their objectives.

The Society's notable expeditions have pushed back the historic horizons of the southwestern United States to a period nearly eight centuries before Columbus crossed the Atlantic. By dating the ruins of the vast communal dwellings in that region, The Society's researches solved secrets that had puzzled historians for three hundred years.

In Mexico, The Society and the Smithsonian Institution, [illegible] discovered the oldest work of man in the Americas for which we have a date. This slab of stone is engraved in Mayan characters with a date which means November 4, 291 B. C. (Spinden Correlation). It antedates by 200 years anything heretofore dated in America, and reveals a great center of [illegible].

On November 11, 1935, in a flight sponsored jointly by the National Geographic Society and the U. S. Army Air Corps, the world's largest balloon, *Explorer II*, ascended to the world altitude record of 72,395 feet. Capt. Albert W. Stevens and [illegible] of scientific instruments, and obtained results of extraordinary value.

A notable undertaking in the history of astronomy was launched in 1949 by The Society in cooperation with the Palomar Observatory of the California Institute of Technology. This project will require four years to photograph the vast reaches of space, and will provide the first sky atlas for observatories all over the world.

In 1948 The Society sent out seven expeditions to study the eclipse of the sun along a 5,320-mile arc from Burma to the Aleutians. The fruitful results helped link geodetic surveys of North America and Asia.

The Society granted $25,000, and in addition $75,000 was [illegible] the finest of the giant sequoia trees in the Giant Forest of Sequoia National Park of California.

One of the world's largest icefields and glacial systems outside the polar regions was discovered in Alaska and Yukon by Bradford Washburn while exploring for The Society and the Harvard Institute of Exploration, 1938.

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TIPS ON TRAVEL

by BRADLEY WESTON

World Traveler, Author and Travel Columnist

WHERE LIFE HOLDS A THOUSAND CHARMS

[illegible] while everyone else is off carousing around [illegible] countryside, don't fret, for the cause ain't lost. There is still the Fall. While the local folk on this side of the sea are bundling up in furs, the vacation season goes on swimmingly in Southern Europe.

When Autumn comes to Italy, it is both fashionable and pleasant to repair to the watering places—to Fiuggi, to Salso Maggiore, to Montecatini. One sips the waters, takes the cure, listens to the open-air concerts morning and evening, and returns home ready to face winter with a smile.

Chic Clientele at Ischia

Poppies water lilies [illegible] at the surface warmed to fifty degrees, tender as an I fall of [illegible] ity. Up at Montecatini, [illegible] side Florence, you sit under shade trees, listen to the band, sip the water and eat magnificent food.

Ischia, the island near Capri which was the fountain of youth of the old Romans, is popular again. Back in the old days it was a sure cure for the rheumatism a man could get running around a drafty forum in a thin toga. Today its waters are described as the most radioactive in Europe, and it attracts a chic clientele to match.

Carnival of Eating

All of fashionable France repairs to the Basque country in the Fall, when the season centers around the seaside resort of Biarritz. Folklore festivals featuring fiery Basque dances are staged in Biarritz and [illegible] through September. A mild form of bull fighting, [illegible] Spanish [illegible] [illegible] Basque towns in early Fall and also in the ancient Roman arena at Arles in Provence.

While all this act city is rampant in the south of France, up in Burgundy the Burgundians are having at their favorite sport—eating. France's list of Fall festivals is headed by Dijon's Gastronomic Fair, a two-and-a-half-week caloric binge.

Jai Alai between Courses

The Fall lingers long down in Spain, the pulse of life gradually turning from the resorts to Madrid, Barcelona, and Seville. In the capital, golf goes on at Puerta de Hierro Club's course, there are pigeon-shoots, soccer matches and, of course, *jai alai*. At Madrid's Recoletos, a smart dining spot, you watch *jai alai* between courses and dances. Theaters and movie houses don't open until 11 p.m., and the crowd doesn't filter into the night clubs until 1 a.m. Most clubs [illegible] cover charge of about fifty cents. And [illegible] on the Plaza Santa Ana you can hire a troupe of Flamenco dancers and a private room until well past dawn for the likes of twenty dollars.

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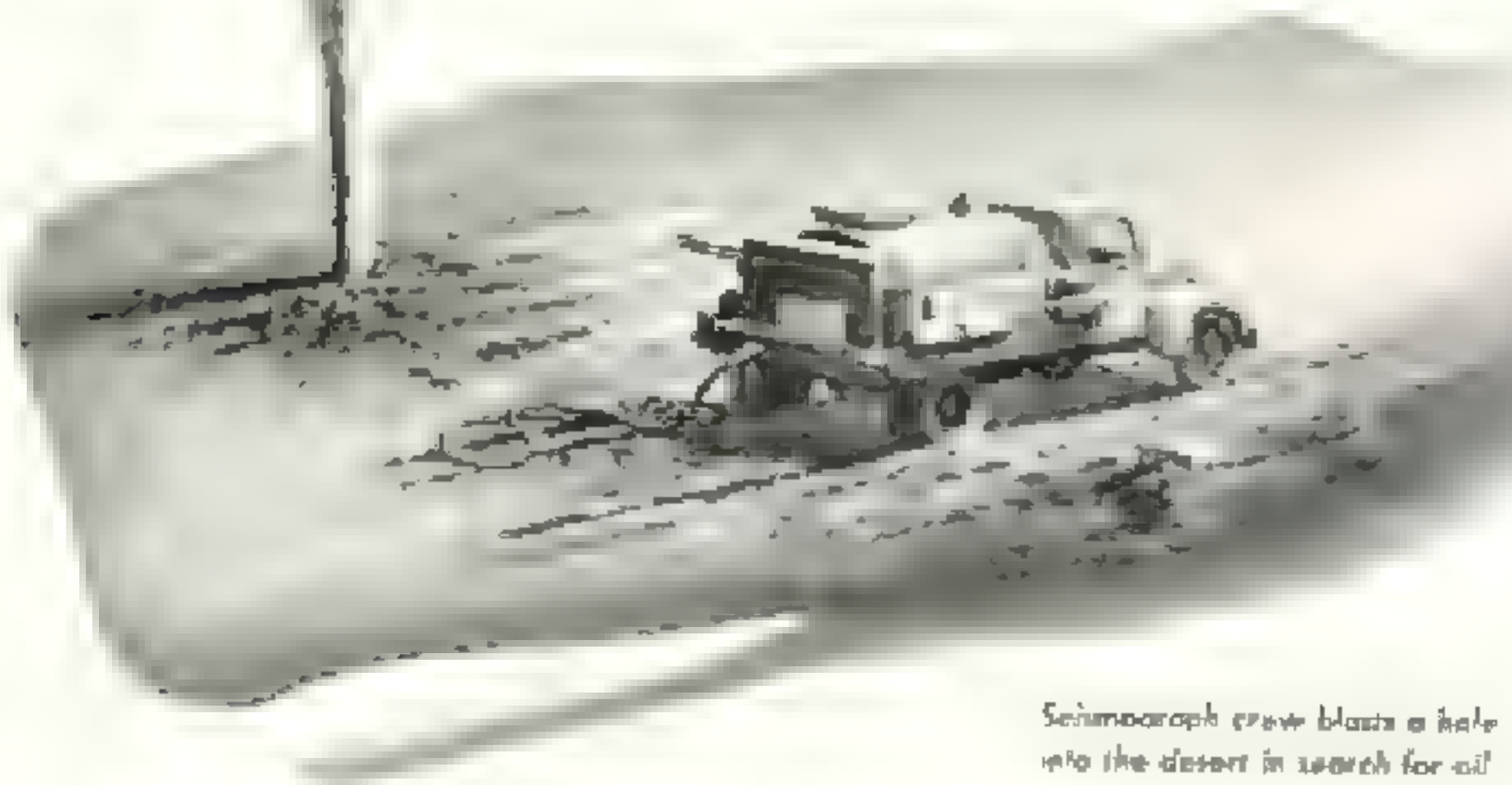
Sinclair growth sparks hunt for added crude oil production



Seismograph crew blasts a hole into the desert in search for oil

When oil for America's lamps was extracted from whale blubber, first you had to find the whale. Today, when America's thirst for gasoline and other petroleum products is world-wide insatiable, the first problem is to find crude oil.

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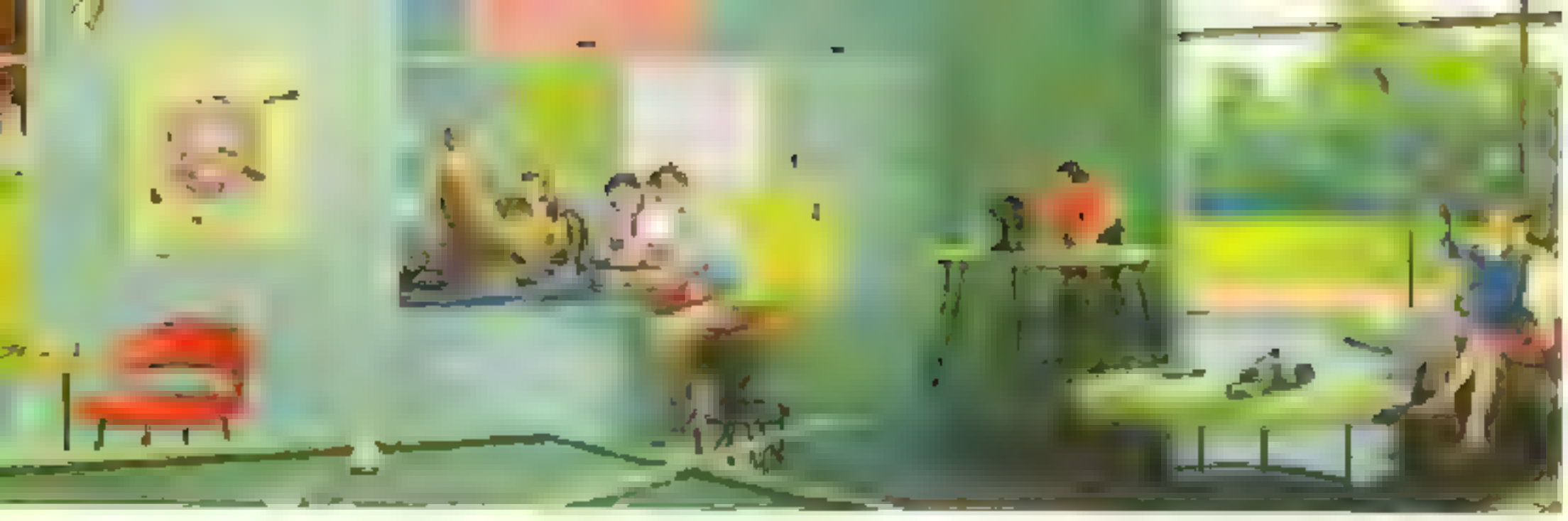

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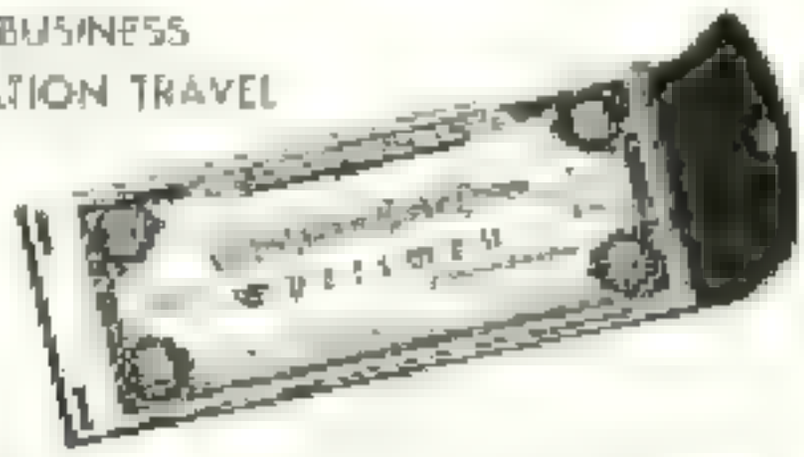

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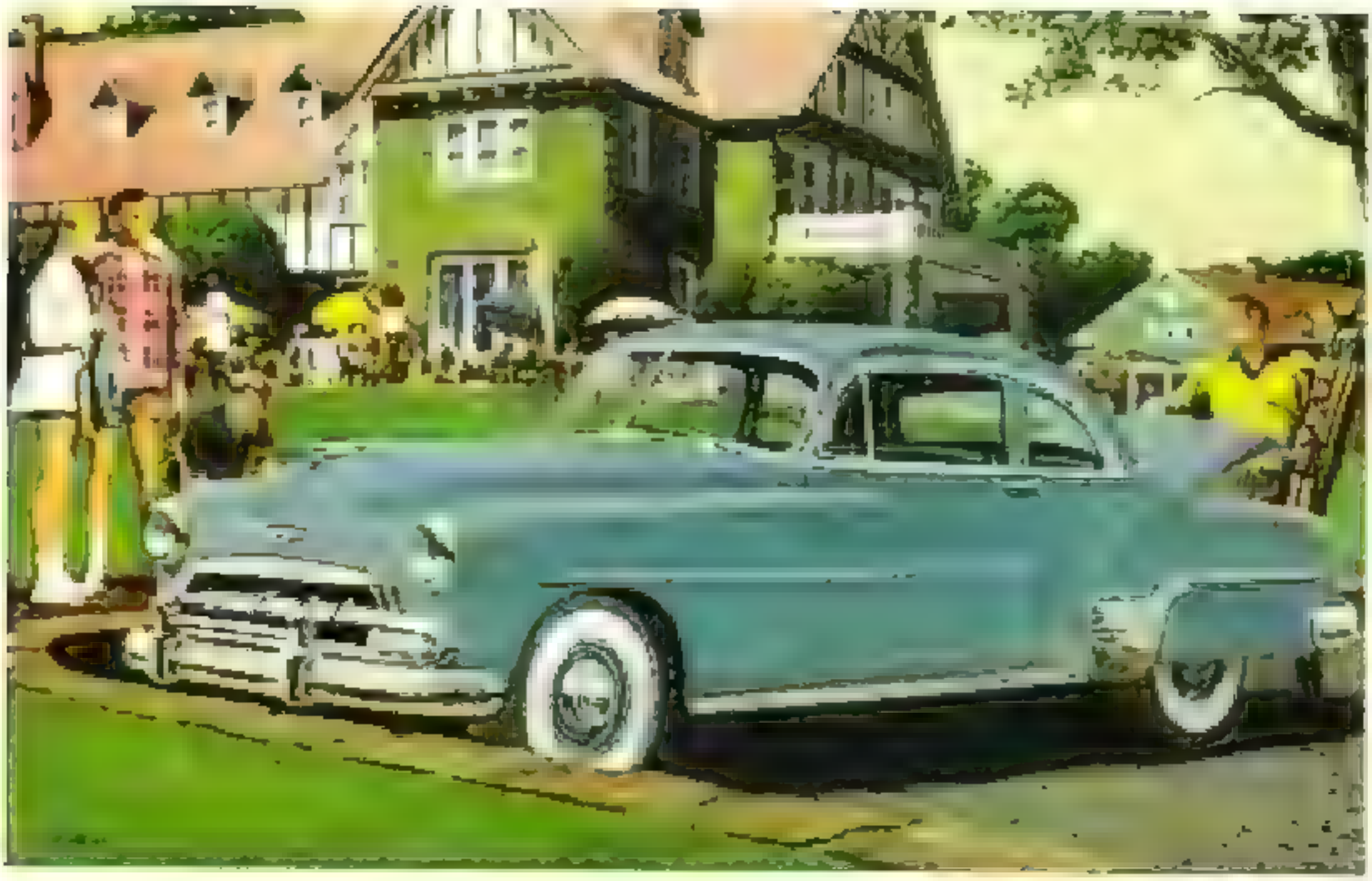

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"The Blue Bird," you see the exquisite Land all misty blue—where countless babies are waiting their time to be born.

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The baby cries lustily as leaving its nest of soft, fleecy clouds—not knowing what kind of an earthly "nest" it will be dropped into.

Every baby cannot be born into a luxurious home—cannot find awaiting it a dainty, hygienic nursery, recalling in beauty the misty cloudland.

But it is every child's rightful heritage to be born into a clean, healthful home where the Blue Bird of Happiness dwells.

As each child is so born—
the community, the nation, and the home are richer. For just as the safety of a building depends upon its foundation of rock or concrete so does the safety of the race depend upon its foundation—the baby.

And just as there is no use in repairing a building above, if its foundation is weak, there is no use in hoping to build a strong civilization except through healthy, happy babies.

Thousands of babies—
die needlessly every year. Thousands of rickety little feet falter along Life's Highway. Thousands of imperfect baby eyes strain to get a clear vision of the wonders that surround them. Thousands of defective ears cannot hear even a mother's lullaby.

And thousands of physically unfit men and women occupy back seats in life, are counted failures—all because of the thousands and thousands of babies who have been denied the birthright of a sanitary and protective home.

So that wherever one looks—the need for better homes is apparent. And wherever one listens can be heard the call for such homes from the Land of Unborn Babies.

The call is being heard—

by the schools and colleges that are establishing classes in homemaking and motherhood; by public nurses and other noble women who are visiting the homes of those who need help and instruction; by the hospitals that are holding Baby Clinics.

By towns and cities that are holding Baby Weeks and health exhibits; by magazines and newspapers that are publishing articles on prenatal care.

By Congress that has passed the Mothers and Babies Act, under which health boards in every State will be called upon to give information to expectant mothers.

All this is merely a beginning—

The ground has hardly been broken for the Nation's only safe foundation—healthy babies—each of whom must have its rightful heritage—An Even Chance—a healthy body.

The call will not be answered until every mother, every father and every community helps to make better homes in which to welcome visitors from the Land of Unborn Babies.

Babies of 1922 have a far better chance of growing up to be sturdy and healthy boys and girls than those born in 1911, the year in which "The Land of Unborn Babies" appeared.

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Metropolitan Life Insurance Company

Unwind it, and there's a Pangolin!

[illegible]

[illegible] while he's out in the open, the pangolin [illegible] rolls his body into a ball. [illegible] And [illegible] like a pine cone [illegible] for to pass him by.

Unfortunately, you can't curl up [illegible] pangolin-wise, when [illegible] you can provide yourself with a sure and reliable [illegible] expense [illegible] loss of money [illegible] may seem.

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You can even make sure you'll have an insurance when a disabling injury causes a long period of disaster.

The man to see about your Accident Insurance is your Travelers [illegible] or broker.

[illegible]

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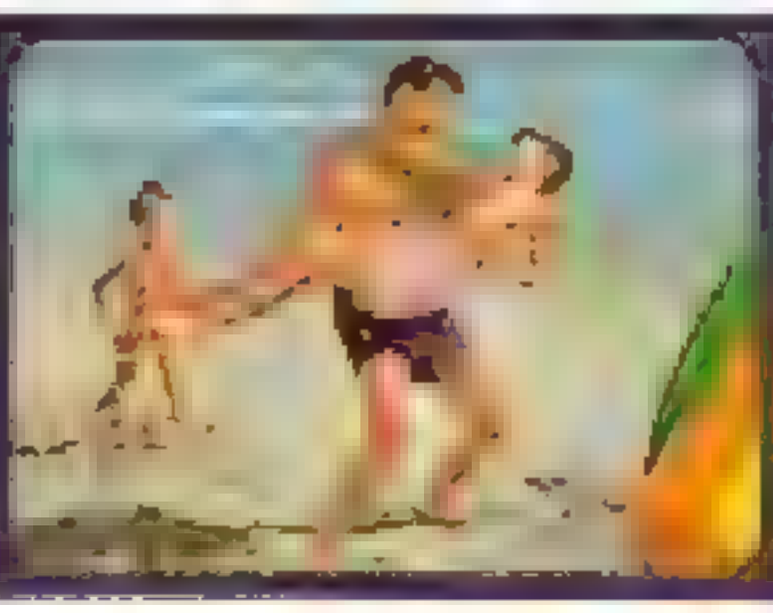

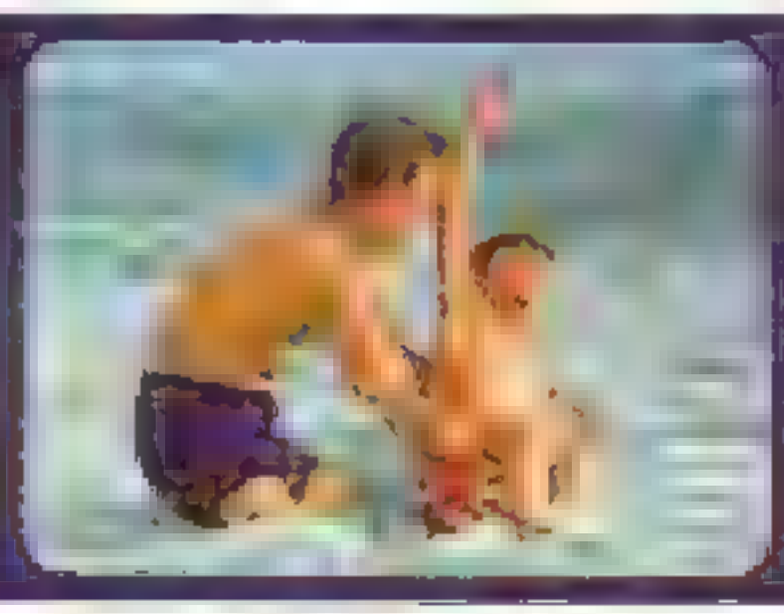

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ELLIS COUNTRY SCHOOL

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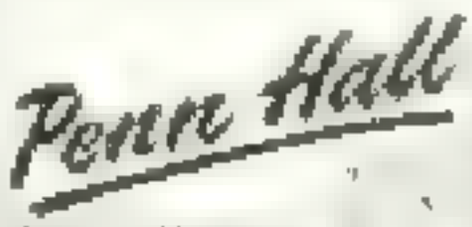
GULF PARK BY-THE-SEA

THE KNOX SCHOOL

LASELL JUNIOR COLLEGE

LINDEN HALL

OAK GROVE A FRIENDS SCHOOL



SOUTHERN SEMINARY & JUNIOR COLLEGE

Colleges for Women

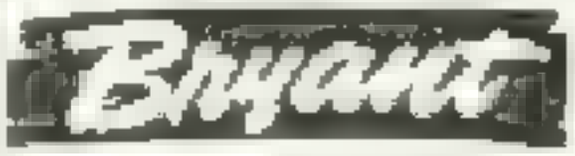
MARYWOOD COLLEGE

Fine and Applied Arts

ART INSTITUTE OF PITTSBURGH

NATIONAL ART SCHOOL

Vocational



COLLEGE

FRANKLIN TECHNICAL INST.

INDIANA TECHNICAL COLLEGE

KATHARINE GIBBS

SPEEDWRITING

TRI-STATE COLLEGE

Colleges for Men

PENNSYLVANIA MILITARY COLLEGE

Boys' Schools

ADMIRAL BILLARD ACADEMY

AUGUSTA MILITARY ACADEMY

BLAIR ACADEMY

PLEASE FILL IN BLANK BELOW, DETACH, AND MAIL TO THE SECRETARY

Recommendation for Membership

IN THE

NATIONAL GEOGRAPHIC SOCIETY

** The Membership Dues, Which Are for the Calendar Year, Include Subscription to the National Geographic Magazine*

To the Secretary, National Geographic Society,
Sixteenth and M Streets Northwest, Washington 6, D. C. _____ *1953*

I nominate _____
PRINT NAME OF NOMINEE

Occupation _____
(This information is important for the records)

Address _____
PRINT ADDRESS OF NOMINEE

_____ *for membership in The Society.*

Name of nominating member _____
PLEASE PRINT

Address _____

*DUES: Annual membership in United States, $5.00; Canada, $5.50; British Isles, $5.60; elsewhere abroad, $6.00. Life Membership, $150.00 U. S. funds. Remittances should be payable to National Geographic Society. Remittances from outside of continental United States and Canada should be made by New York draft or international money order.

8-52

"Do you know the Number?"

Long Distance calls go through faster when you Call by Number

A HELPFUL HINT—Start today to build up a list of out-of-town telephone numbers. Write down those you already know. If there's a new number you don't have—or an old one you've forgotten—be sure to add it to the list when the operator gives it to you.

"You'll save time if you give me the out-of-town number you're calling.

"That way I can put your call through without first calling 'Information' in the distant city.

"Your own call goes through faster. And you help speed the service for everyone. That's especially important now, when so many urgent defense calls are on the Long Distance lines."

BELL TELEPHONE SYSTEM